A.4.1

Ohio EPA
State of Ohio Environmental Protection Agency

STREET ADDRESS:
zarus Government Center
122 South Front St.
Columbus, OH 43215

TELE: (614) 644-3020 FAX: (614) 644-2329

MAILING ADDRESS:
Lazarus Government Center
P. O. Box 1049
Columbus, OH 43216-1049

Certified Mail

RECEIVED
MAR 01 2002
RCRA RECORDS ROOM
Waste, Pesticides & Toxics Division
U.S. EPA—REGION 5

ENTERED ... JOURNAL
DEC 27 2001
OHIO E.P.A.

DEC 27 2001

John Hanley
Axsys Technologies, Inc.
175 Capital Boulevard
Suite 103
Rocky Hill, CT 06067

Re: ***Amended Closure Plan Approval, Morgan Matroc (Vernitron Piezoelectric Division), 232 Forbes Road, Bedford, OH 44146, OHD 052 324 290***

Dear Mr. Hanley:

On January 16, 2001, Morgan Matroc submitted to Ohio EPA an amended closure plan for the former outside drum storage area located at 232 Forbes Road, Bedford, Ohio. Revisions to the amended closure plan were received on March 23, 2001 and October 29, 2001. The amended closure plan was submitted pursuant to rule(s) 3745-66-11 and 3745-66-12 of the Ohio Administrative Code (OAC) in order to demonstrate that Morgan Matroc's proposal for amended closure complies with the requirements of OAC rules 3745-66-11 and 3745-66-12.

The owner or operator and the public were given the opportunity to submit written comments regarding the amended closure plan in accordance with the hazardous waste rule requirements. No public comments were received by Ohio EPA.

Based upon review of Morgan Matroc's submittal and subsequent revisions, I conclude that the amended closure plan for the hazardous waste facility at 232 Forbes Road meets the performance standard contained in OAC rule 3745-66-11 and complies with the pertinent parts of OAC rule(s) 3745-66-12. The amended closure plan submitted to Ohio EPA on January 16, 2001 and revised on March 23, 2001 and October 29, 2001 by Morgan Matroc is hereby approved.

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.
By: Jana L Clements Date 12-27-01

Compliance with the approved closure plan is expected. Ohio EPA will monitor such compliance. The director expressly reserves the right to take action, pursuant to chapters 3734. and 6111. of the Ohio Revised Code, and other applicable law, to enforce such compliance and to seek appropriate remedies in the event of noncompliance with the provisions and modifications of this approved closure plan. Please be advised that approval of this amended closure plan does not release Morgan Matroc from any responsibilities regarding corrective action for all releases of hazardous waste or constituents from any waste management unit, regardless of the time at which waste was placed in the unit.

You are hereby notified that this action of the Director of Environmental Protection is final and may be appealed to the Environmental Review Appeals Commission pursuant to Ohio Revised Code section 3745.04. The appeal must be in writing and set forth the action complained of and the grounds upon which the appeal is based. The appeal must be filed with the commission within 30 days after notice of the director's action. Notice of the filing of the appeal shall be filed with the director within three days after the appeal is filed with the commission. An appeal may be filed with the commission at the following address:

Environmental Review Appeals Commission
236 East Town Street
Room 300
Columbus, Ohio 43215

When closure is completed, OAC rule 3745-66-15 requires the owner or operator of a facility to submit to the director of Ohio EPA, certification by the owner or operator and an independent, registered professional engineer, that the facility has been closed in accordance with the approved closure plan. The certification by the owner or operator shall include the statement found in OAC rule 3745-50-42(D). These certifications should be submitted to: Ohio Environmental Protection Agency, Division of Hazardous Waste Management, Attn: Pamela Allen, Information Technologies and Technical Support Section, P.O. Box 1049, Columbus, Ohio 43216-1049.

Ohio EPA, Division of Hazardous Waste Management, strongly encourages you to consider pollution prevention options for any processes at your facility that generate waste. While implementation of pollution prevention options is not required by Ohio laws and regulations, the application of waste minimization practices may help reduce the expense of remedial activities. Additionally, implementation of pollution prevention options may prevent the creation of new units and, as a result, eliminate the requirement to submit a closure plan in the future. For assistance in identifying and implementing pollution prevention options, contact Wade Balser at (330) 963-1278

Sincerely,

Christopher Jones

Christopher Jones
Director

cc: Pamela Allen, DHWM Central File, Ohio EPA
Ed Lim, Manager, Engineering & Risk Assessment Section, CO, Ohio EPA
Harriet Croke, USEPA - Region V
Wade Balser, DHWM, NEDO, Ohio EPA
John Palmer, DHWM, NEDO, Ohio EPA

CJ/WB:ddw

OhioEPA
State of Ohio Environmental Protection Agency
Northeast District Office

10 E. Aurora Road
Twinsburg, Ohio 44087-1969

TELE (330) 425-9171 FAX (330) 487-0769

Bob Taft, Governor
Christopher Jones, Director

CERTIFIED MAIL

March 22, 2001

RECEIVED
MAR 27 2001
MNOHWI PERMIT SECTION - WMB
Waste, Pesticides & Toxics Division
U.S. EPA - REGION 5

Phillip Rahn
Waters Edge Environmental LLC
4901 Waters Edge Drive
Raleigh, NC 27606

RE: NOTICE OF DEFICIENCY, AMENDED CLOSURE PLAN, MORGAN MATROC (AKA VERNITRON PIEZOELECTRIC DIVISION), OHD 052 324 290

Dear Mr. Rahn:

On January 16, 2000, Ohio EPA received from Morgan Matroc an amended closure plan for the container storage area located at 232 Forbes Road, Bedford, Ohio. The amended closure plan revises and updates sections of the facility's currently approved 1993 closure plan.

Ohio EPA, Division of Hazardous Waste Management (DHWM) has conducted a review of the above referenced closure plan. Enclosed, as an attachment (Attachment 1) to this correspondence, are the detailed deficiency comments on the closure plan. Please provide a revised closure plan addressing all areas indicated in the deficiency comments. Ohio Administrative Code (OAC) rule 3745-66-12 require that such a revised amended closure plan be submitted to the director of Ohio EPA for approval within thirty (30) days of the receipt of this letter.

The revised amended closure plan shall be prepared in accordance with the following editorial protocol or convention:

1. Old Language is over-struck, but not obliterated.

2. New Language is capitalized.

3. Page headers should indicate date of submission.

4. If significant changes are necessary, pages should be re-numbered, table of contents revised, and complete sections provided as required.

The revised amended closure plan should be submitted to: Ohio Environmental Protection Agency, Division of Hazardous Waste Management, Attn: Pamela Allen, Manager, Data Management Section, P.O. Box 1049, Columbus, Ohio 43216-1049. A copy should also be sent to: Wade Balser, Ohio EPA, Northeast District Office, 2110 East Aurora Road, Twinsburg, Ohio.

Ohio EPA will, pursuant to OAC rule 3745-66-12, review the re-submitted plan and issue a final action approving or modifying the plan. Ohio EPA's final action on the re-submitted plan is appealable to the Environmental Review Appeals Commission.

If you wish to arrange a meeting to discuss your responses to this Notice of Deficiency, please contact Wade Balser, at (330) 963-1278.

Ohio EPA, DHWM, strongly encourages you to consider pollution prevention options for any processes at your facility that generate waste. While implementation of pollution prevention options is not required by Ohio laws and regulations, the application of waste minimization practices may help reduce the expense of remedial activities. Additionally, implementation of pollution prevention options may prevent the creation of new units and as a result eliminate the requirement to submit a closure plan in the future. For assistance in identifying and implementing pollution prevention options, contact Wade Balser.

Sincerely,

Kurt Princic
DO Unit Supervisor
Division of Hazardous Waste Management

KP:ddw

cc: Cindy McNickel, Axsys Technologies, Inc.
Pamela Allen, DHWM, Central File, Ohio EPA
Harriet Croke, U.S. EPA, Region V
Ed Lim, Manager, Engineering & Risk Assessment Section, CO, Ohio EPA
Wade Balser, DHWM, NEDO, Ohio EPA

ec: John Palmer, DHWM, NEDO, Ohio EPA
Harry Courtright, DHWM, NEDO, Ohio EPA

Attachment 1

Section 3.0

1. The closure standard for volatile organic compounds (VOCs) in soils and groundwater should use Ohio EPA's Residential Generic Cleanup Numbers (GCNs). If a GCN has not been developed by Ohio EPA for a constituent of concern, the facility may elect to use U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) upon Ohio EPA approval. GCNs and PRGs must be adjusted to account for multiple constituents. If the adjusted single chemical GCN for a constituent of concern is lower than the practical quantitation limit (PQL), the PQL will be used.

2. The Ohio EPA GCN table referenced in Appendix A should be replaced with Ohio EPA's most updated version (Closure Plan Review Guidance Supplement, September 2000).
www.epa.state.oh.us/dhwm/supplemental.htm

Section 4.0

1. The following corrections should be made on Figure 2, Proposed Soil Remediation Map for Lead (245 mg/kg): 1) At sample location SB-76 (4-5 foot) should read 68 mg/kg; 2) At sample location SB-30 (1-1.5 feet) should read 1,020 mg/kg; 3) Sample location 35N 62W is missing sample information from depths of 1-2 feet, 4-5 feet, and 7-8 feet; 4) At sample location SB-35 (1-1.5 feet) a comma should be added to the value; and 5) The removal area in the vicinity of sample number 0N 100W is not defined in the legend portion of the figure.

Section 4.1 Soil Sampling and Analysis for Volatile Organic Compounds (VOCs)

1. Section 4.1 of the approved 1993 Closure Plan should be updated. Soil sampling collection procedures should follow SW-846 Method 5035 for the preservation of VOCs in soil.

Section 5.1.1 (Refer to comment number 1 in Section 3.0 above)

1. The facility has the following two options to obtain clean closure standards for soil and groundwater contaminated with VOCs at the site:

Option 1 - VOC Contaminated Soil Removal Using GCNs

- VOC contaminated soil may be removed to levels which meets Ohio EPA's Single Chemical Cleanup Number Protective of Ground Water at dilution attenuation factor of 1 (Table 1, Residential, Column 12). These levels must be adjusted to account for multiple constituents.

- Once soil levels meet the above criteria, VOCs concentrations in groundwater may be remediated to levels which meet Ohio EPA's Single Chemical Cleanup Number Ground Water Concentration (Table 1, Residential, Column 8). These levels will also need to be adjusted to account for multiple constituents.

Option 2 - Site Specific Risk Assessment

- The facility may elect to perform a site specific risk assessment to quantify clean closure levels for VOCs in soils and groundwater at the site.

Once one of the above selected closure standards are achieved (and the groundwater remediation ceases operation), the facility will be required to perform eight quarters of groundwater monitoring to demonstrate clean closure.

<u>Section 5.2</u>

1. The Ohio EPA agrees that removal of lead-contaminated soils will be the initial work task followed by the implementation of a remedial alternative for VOCs in soils. However, if the selected remedial alternative deviates from that identified in the approved closure plan (soil vapor extraction and groundwater recovery system), the closure plan must be amended to reflect these changes. The Ohio EPA acknowledges the fact that VOC impacted soil may also be removed during the initial work task.

<u>Section 5.2.2</u>

1. Ohio EPA agrees with the statements made in this section. However, the facility should also have means necessary to control fugitive dust emissions which may result during excavation activities.

2. Ohio EPA does not agree with the sample grid calculations listed in Appendix C. The score for "Access Control" in step number three should be scored with a three. This score is due to contamination on adjacent residential properties. This would change the sample grid interval to approximately 19 feet.

<u>Section 5.4</u>

1. The Ohio EPA agrees that there may not be a need to perform a cleaning procedure of the paved areas used for the storage of waste. As you indicated, the former storage pad will be removed during removal efforts. Although, the removed concrete/asphalt will need to be characterized and disposed of properly in accordance with all EPA and Ohio EPA regulations.

Section 8.0

1. The Ohio EPA agrees that the rinsate may be analyzed for total RCRA metals along with pH, and VOCs.

Section 10

1. The closure schedule listed in Appendix D would extend the currently approved closure period for a time frame of 137 days. The closure period will expire on March 31, 2001. Ohio EPA suggests that the facility extend the its closure schedule to account for VOC contaminated soil and groundwater remedial activities.

Additional Comments:

1. Once the closure plan is approved by Ohio EPA, the facility will no longer be required to contact Ohio EPA for updates to the risk-based concentration (RBC) for lead.

2. At sample location number SB-64 (4-5 feet) lead was detected at 237 mg/kg. The Ohio EPA recommends that this area be re-sampled during the confirmation sampling event.

3. The facility should update the closure cost estimate listed in Section 9.0 of the approved 1993 closure plan. OAC rule 3745-66-42(C) requires the owner or operator of a facility to submit a revised closure cost estimate (CCE) no later than 30 days after a revision has been made to the closure plan which increases the cost of the closure. OAC 3746-66-42(E) requires the owner or operator of a facility to annually submit current, detailed CCE's prepared and maintained in accordance with paragraphs (A) and (B) of this rule (i.e., in current dollars or adjusted for inflation).

4. The extent of VOCs in soil has not been completely defined to the east of the site towards the Gilbert Property (Parcel #34).

5. If access is denied from an residential property owner, the details of request seeking permission must be thoroughly documented and submitted to Ohio EPA.

6. Appendix H of the approved 1993 closure plan (Sample containers and Preservation) should be updated prior to plan approval.

7. Appendix F of the approved 1993 closure plan (Site Health and Safety Plan) should be updated prior to initiation of field activities.

OhioEPA
State of Ohio Environmental Protection Agency

ADDRESS:
... WaterMark Drive
Columbus, OH 43215-1099

TELE: (614) 644-3020 FAX: (614) 644-2329

MAILING ADDRESS:
P.O. Box 1049
Columbus, OH 43216-1049

RECEIVED
MAR 23 1998
DIVISION FRONT OFFICE
Waste, Pesticides & Toxics Division
U.S. EPA – REGION 5

Certified Mail
Return Receipt Requested

Re: ***Closure Plan Extension***
Axsys Technologies, Inc.
(fka Mogan Matroc, fka
Vernitron) Cuyahoga County
OHD #: 052 324 290

March 18, 1998

OHIO E.P.A.
MAR 18 98
ENTERED DIRECTOR'S JOURNAL

Mr. Kenneth Kupcak
Axsys Technologies, Inc.
232 Forbes Road
Bedford, Ohio 44146

Dear Mr. Kupcak:

On April 8, 1997, the consulting firm of Tetra Tech EM, Incorporated, acting on behalf of the Axsys Technologies, Inc., Inc. (formerly Vernitron Piezoelectric), in regard to the site located at 232 Forbes Road in Bedford, Ohio, submitted a request for an extension to the closure period specified in the approved closure plan dated September 30, 1993, which expired on March 1, 1998, for 365 days, until March 1, 1999. The extension request was submitted pursuant to OAC Rule 3745-66-13(B) as closure will require longer than the period specified in the approved closure plan. Axsys Technologies, Inc. has requested this extension due to delays in gaining an NPDES permit, which is necessary to begin the remediation.

My staff reviewed your request and recommends that the extension be granted per Rule 3745-66-13(B) of the OAC. I concur and am therefore granting this extension request. This extension is being granted for the above referenced closure plan and expires on March 1, 1999.

Axsys Technologies, Inc. shall continue to take all steps to prevent a threat to human health and the environment from the unclosed but inactive waste management unit per OAC Rule 3745-66-13(B)(2).

Please be advised that approval of this closure extension request does not release Axsys Technologies, Inc. from any responsibilities as required under the Hazardous and Solid Waste Amendments of 1984 regarding corrective action for all releases of hazardous waste or constituents from any solid waste management unit, regardless of the time at which waste was placed in the unit.

When closure is completed, the Ohio Administrative Code Rule 3745-66-15 requires the owner or operator of a facility to submit to the director of the Ohio EPA certification by the owner or operator and an independent professional engineer that the facility has been closed in accordance with the specifications in the approved closure plan. These certifications shall follow

I certify this to be a true and accurate copy of th
official document as filed in the records of the Ohi
Environmental Protection Agency.
By: Jona L Clements Date 3-18-9

the format specified in OAC 3745-50-42(D), and should be submitted to: Ohio Environmental Protection Agency, Division of Hazardous Waste Management, Attn: Tom Crepeau, Data Management Section, P.O. Box 1049, Columbus, Ohio, 43216-1049.

You are hereby notified that this action of the director is final and may be appealed to the Environmental Review Appeals Commission ("ERAC") pursuant to Section 3745.04 of the Ohio Revised Code. The appeal must be in writing and set forth the action complained of and the ground upon which the appeal is based. This appeal must be filed with the ERAC within thirty (30) days from the receipt of this letter. A copy of the appeal must be served to the director of the Ohio Environmental Protection Agency within three (3) days of filing with the ERAC. An appeal must be filed at the following address:

Environmental Review Appeals Commission
236 East Town Street
Room 300
Columbus, Ohio 43215

Sincerely,

Jennifer Gill for

Donald R. Schregardus
Director

axsys/closures.ao

cc: Tom Crepeau, DHWM Central File, Ohio EPA
Harriet Croke, Ohio Permit Section, U.S. EPA - Region V ✓
Montee Suleiman, Ohio EPA, DHWM, CO
Tina Jennings, Ohio EPA, DHWM, CO
Karen Nesbit, Ohio EPA, DHWM, NEDO
Frank Popotnik, Ohio EPA, DHWM, NEDO

OHIO E.P.A.
MAR 18 98
ENTERED DIRECTOR'S JOURNAL

Ohio EPA
State of Ohio Environmental Protection Agency

STREET ADDRESS:
1800 WaterMark Drive
Columbus, OH 43215-1099

TELE: (614) 644-3020 FAX: (614) 644-2329

MAILING ADDRESS:
P.O. Box 1049
Columbus, OH 43216-1049

April 22, 1997

CERTIFIED MAIL

RE: CLOSURE PLAN EXTENSION
MORGAN MATROC
CUYAHOGA COUNTY
OHD 052 324 290

RECEIVED
APR 28 1997
OFFICE OF RCRA
Waste Management Division
U.S. EPA, REGION V

Mr. Kenneth Kupcak
Morgan Matroc Incorporated
232 Forbes Road
Bedford OH 44146

Dear Mr. Kupcak:

On April 8, 1997, the consulting firm of Hydro-Search Incorporated, acting on behalf of the Vernitron Piezoelectric group, in regard to the site located at 232 Forbes Road in Bedford, Ohio, submitted a request for an extension to the closure period specified in the approved closure plan dated September 30, 1993, which expired on March 1, 1997, for 365 days, until March 1, 1998. The extension request was submitted pursuant to OAC Rule 3745-66-13(B) as closure will require longer than the period specified in the approved closure plan. Morgan Matroc has requested this extension due to delays in gaining off-site property access, and delays in obtaining an NPDES permit, both of which are necessary to begin the remediation.

My staff reviewed your request and recommends that the extension be granted per Rule 3745-66-13(B) of the OAC. I concur and am therefore granting this extension request. This extension is being granted for the above referenced closure plan and expires on March 1, 1998.

Morgan Matroc shall continue to take all steps to prevent a threat to human health and the environment from the unclosed but inactive waste management unit per OAC Rule 3745-66-13(B)(2).

Please be advised that approval of this closure extension request does not release Morgan Matroc from any responsibilities as required under the Hazardous and Solid Waste Amendments of 1984 regarding corrective action for all releases of hazardous waste or constituents from any solid waste management unit, regardless of the time at which waste was placed in the unit.

I certify this to be a true and accurate copy of the document as filed in the records of the Ohio Environmental Protection Agency.
Kara Yoder Date 4/22/97

OHIO E.P.A.
APR 22 97
ENTERED DIRECTOR'S JOURNAL

Mr. Kenneth Kupcak
Morgan Matroc Incorporated
Page Two

When closure is completed, the Ohio Administrative Code Rule 3745-66-15 requires the owner or operator of a facility to submit to the director of the Ohio EPA certification by the owner or operator and an independent professional engineer that the facility has been closed in accordance with the specifications in the approved closure plan. These certifications shall follow the format specified in OAC 3745-50-42(D), and should be submitted to: Ohio Environmental Protection Agency, Division of Hazardous Waste Management, Attn: Tom Crepeau, Data Management Section, P.O. Box 1049, Columbus, OH, 43216-1049.

You are hereby notified that this action of the director is final and may be appealed to the Environmental Review Appeals Commission (formerly known as the Environmental Board of Review) pursuant to Section 3745.04 of the Ohio Revised Code. The appeal must be in writing and set forth the action complained of and the ground upon which the appeal is based. This appeal must be filed with the Environmental Review Appeals Commission within thirty (30) days from the receipt of this letter. A copy of the appeal must be served to the director of the Ohio Environmental Protection Agency within three (3) days of filing with the Board. An appeal must be filed at the following address:

Environmental Review Appeals Commission
236 East Town Street
Room 300
Columbus, OH 43215

Sincerely,

Donald R. Schregardus

Donald R. Schregardus
Director

DRS/JBP/cl
cc: Tom Crepeau, DHWM Central File, Ohio EPA
Harriet Croke, Ohio Permit Section, U.S. EPA - Region V
Montee Suleiman, Ohio EPA, DHWM, CO
Tina Jennings, Ohio EPA, DHWM, CO
John Palmer, Ohio EPA, DHWM, NEDO
Harry Courtright, Ohio EPA, DHWM, NEDO

STREET ADDRESS:
1800 WaterMark Drive
Columbus, OH 43215-1099

TELE: (614) 644-3020 FAX: (614) 644-2329

MAILING ADDRESS:
P.O. Box 1049
Columbus, OH 43216-1049

June 24, 1996

Re: Compietion of Closure
Morgan Matroc Inc.
OHD052324290

Mr. Kenneth Kupcak
Morgan Matroc Inc.
232 Forbes Road
Bedford, Ohio 44146

Dear Mr. Kupcak:

According to Ohio EPA records, on September 30, 1993, the Director of the Ohio EPA approved a closure plan for Morgan Matroc, Inc., 232 Forbes Road, Bedford, Ohio. The plan concerned a hazardous waste drum storage unit at the facility. On February 14, 1996 and June 14, 1996, Ohio EPA, Northeast District Office received certification documents stating that the drum storage unit had been closed according to the specifications in the approved closure plan. Ohio EPA District Office personnel completed a closure inspection and a review of documents pertaining to the drum storage unit on December 27, 1994.

Based on this review, the Ohio EPA has determined that the hazardous waste drum storage unit has been closed in accordance with the approved closure plan and Rules 3745-66-12 through 3745-66-15 of the Ohio Administrative Code (OAC). Morgan Matroc, Inc., will continue to operate as a treatment, storage, and disposal (TSD) facility.

As specified in OAC Rule 3745-66-40, Morgan Matroc, Inc., will not be required to maintain financial assurance for closure costs and liability coverage for accidental occurrences at this location, in accordance with OAC Rules 3745-66-43(H) and 3745-66-47(E).

Please note that this letter does not relieve the facility of any corrective action responsibilities that may be required.

If you have any questions concerning the closure process or the current status of the facility, please contact the Ohio EPA, Northeast District Office, Attn: John Palmer, 2110 Aurora Road, Twinsburg, Ohio 44087, tel: (216) 963-1200.

Sincerely yours,

Thomas E. Crepeau

Thomas E. Crepeau, Manager
Data Management Section
Division of Hazardous Waste Management

cc: Harriet Croke, U.S. EPA, Region 5
Montee Suleiman, DHWM
Maria Velalis, DHWM
Linda Neumann, DHWM
John Palmer, NEDO

RECEIVED
JUN 1 1996
OFFICE OF RCRA
WASTE MANAGEMENT DIVISION
EPA, REGION V

INTEROFFICE COMMUNICATION

TO: Tom Crepeau, DHWM, CO

JBP

FROM: John Palmer, DHWM, NEDO, through Harry Courtright, DHWM, NEDO

SUBJECT: Morgan Matroc
f.k.a. Vernitron Piezoelectric Division
OHD 052 324 290
Cuyahoga County

DATE: June 14, 1996

Please record a change in status for the Morgan Matroc facility located at 232 Forbes Road, Bedford, Ohio. They have certified closure of an inside drum storage unit. Closure remains to be performed on the outside land disposal unit, and Morgan Matroc will remain a treatment/ storage/ disposal facility.

On February 14, 1996, and on June 14, 1996, the Ohio EPA received documentation from Morgan Matroc. This documentation contained records documenting closure of the unit, data demonstrating that clean closure had been obtained, and a certification statement signed by an authorized facility representative and a Registered Professional Engineer.

A post closure certification inspection for the former hazardous waste drum storage unit was performed on December 27, 1994. Issues related to the land disposal facility overshadowed the certification of this inside unit. The additional washing and sampling required was not performed until April 1995. Hence the delay between the inspection date and this memorandum.

To the best of my knowledge, the closure was conducted in accordance with the approved closure plan and all applicable hazardous waste regulations. The closure certification was prepared by Hydro-Search, Incorporated, and certified by Robert Finkelstein, P.E. (for Hydro-Search, Inc.), and Elliot N. Konopko, Vice President of Vernitron Corporation. The certification was received at this office on February 14, 1996 and June 14, 1996. The certification contained the correct wording as specified in OAC Rule 3745-50-42 (D). Laboratory data documenting the decontamination efforts and manifest documentation of proper waste disposal were included in these documents.

The facility was an interim status TSD prior to closure of this unit, and will remain so.

The correspondence address for the facility is:

Mr. Kenneth Kupcak
Morgan Matroc Incorporated
232 Forbes Road
Bedford OH 44146

ENVIRONMENTAL MEASURES: 1400 gallons of F001, F005 wastes and five cubic yards of D008, F001, F003, and F005 wastes were manifested off-site to permitted treatment/ storage/ disposal facilities.

JBP:cl

cc: Harriet Croke, USEPA Region V
Harry Courtright, DHWM, NEDO
Diane Kurlich, DDAGW, NEDO
Linda Neumann, DHWM, CO
Ms. Kathryn T. Allford, Hydro-Search, Incorporated

OhioEPA
State of Ohio Environmental Protection Agency

STREET ADDRESS: 1800 WaterMark Drive
Columbus, OH 43215-1099

TELE: (614) 644-3020 FAX: (614) 644-2329

MAILING ADDRESS: P.O. Box 1049
Columbus, OH 43216-1049

CERTIFIED MAIL

March 11, 1996

RE: CLOSURE PLAN EXTENSION
MORGAN MATROC
CUYAHOGA COUNTY
OHD 052 324 290

OHIO E.P.A.
MAR 11 96
ENTERED DIRECTOR'S JOURNAL

Mr. Kenneth Kupcak
Morgan Matroc Incorporated
232 Forbes Road
Bedford OH 44146

Dear Mr. Kupcak:

On February 26, 1996, the consulting firm of Hydro-Search Incorporated, acting on behalf of the Vernitron Piezoelectric group, in regard to the site located at 232 Forbes Road in Bedford, Ohio, submitted a request for an extension to the closure period specified in the approved closure plan dated September 30, 1993, due to expire on February 29, 1996, for 365 days, until March 1, 1997. The extension request was submitted pursuant to OAC Rule 3745-66-13(B) as closure will require longer than the period specified in the approved closure plan. Morgan Matroc has requested this extension due to delays in gaining off-site property access, the discovery of new information regarding the aquifer which will affect closure activities, and a denial for a discharge permit by the local waste water authority which will necessitate obtaining an NPDES permit.

My staff reviewed your request and recommends that the extension be granted per Rule 3745-66-13(B) of the OAC. I concur and am therefore granting this extension request. This extension is being granted for the above referenced closure plan and expires on March 1, 1997.

Morgan Matroc shall continue to take all steps to prevent a threat to human health and the environment from the unclosed but inactive waste management unit per OAC Rule 3745-66-13(B)(2).

Please be advised that approval of this closure extension request does not release Morgan Matroc from any responsibilities as required under the Hazardous and Solid Waste Amendments of 1984 regarding corrective action for all releases of hazardous waste or constituents from any solid waste management unit, regardless of the time at which waste was placed in the unit.

I certify this to be a true and accurate copy of th
official document as filed in the records of the Ohi
Environmental Protection Agency.

By: Mary Cavin Date 3-11-96

When closure is completed, the Ohio Administrative Code Rule 3745-66-15 requires the owner or operator of a facility to submit to the Director of the Ohio EPA certification by the owner or operator and an independent professional engineer that the facility has been closed in accordance with the specifications in the approved closure plan. These certifications shall follow the format specified in OAC 3745-50-42(D), and should be submitted to: Ohio Environmental Protection Agency, Division of Hazardous Waste Management, Attn: Tom Crepeau, Data Management Section, P.O. Box 1049, Columbus, OH, 43216-1049.

You are hereby notified that this action of the Director is final and may be appealed to the Environmental Board of Review pursuant to Section 3745.04 of the Ohio Revised Code. The appeal must be in writing and set forth the action complained of and the ground upon which the appeal is based. This appeal must be filed with the Environmental Board of Review within thirty (30) days from the receipt of this letter. A copy of the appeal must be served to the Director of the Ohio Environmental Protection Agency within three (3) days of filing with the Board. An appeal must be filed at the following address:

Environmental Board of Review
236 East Town Street
Room 300
Columbus, OH 43215

Sincerely,

Donald R. Schregardus
Director

DRS/JBP/cl

cc: Tom Crepeau, DHWM Central File, Ohio EPA
Harriet Croke, Ohio Permit Section, U.S. EPA - Region V
Montee Suleiman, Ohio EPA, DHWM, CO
Tina Jennings, Ohio EPA, DHWM, CO
John Palmer, Ohio EPA, DHWM, NEDO
Harry Courtright, Ohio EPA, DHWM, NEDO

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Cavin Date 3-11-96

OHIO E.P.A.
MAR 11 96
ENTERED DIRECTOR'S JOURNAL

OhioEPA
State of Ohio Environmental Protection Agency

. .O. Box 1049, 1800 WaterMark Dr.
Columbus, Ohio 43266-0149
(614) 644-3020
FAX (614) 644-2329

RECEIVED
OCT 05 1993
PERMIT SECTION
EPA, REGION V

George V. Voinovich
Governor

Donald R. Schregardus
Director

AMENDED CLOSURE PLAN APPROVAL

OCT 12 1993
RECEIVED
WMD RCRA
RECORD CENTER

CERTIFIED MAIL

September 30, 1993

RE: AMENDED CLOSURE PLAN
VERNITRON PIEZOELECTRIC
CUYAHOGA COUNTY
OHD 052 324 290

Vernitron Piezoelectric
Mr. Ron Roch
232 Forbes Road
Bedford, OH 44146

Dear Mr. Roch:

On December 19, 1991, Vernitron Piezoelectric submitted to Ohio EPA an amended closure plan for a land disposal facility, located at 232 Forbes Road, Bedford, Ohio. Revisions to the amended closure plan were received on May 27, 1993. The amended closure plan was submitted pursuant to Rule 3745-66-12 of the Ohio Administrative Code (OAC) in order to demonstrate that Vernitron Piezoelectric's proposal for closure complies with the requirements of OAC Rules 3745-66-11 and 3745-66-12.

The public was given the opportunity to submit written comments regarding the amended closure plan of Vernitron Piezoelectric in accordance with OAC Rule 3745-66-12. No comments were received by Ohio EPA in this matter.

Based upon review of Vernitron Piezoelectric's submittal and subsequent revisions, I conclude that the amended closure plan for the hazardous waste facility at 232 Forbes Road, Bedford, Ohio, as modified herein, meets the performance standard contained in OAC Rule 3745-66-11 and complies with the pertinent parts of OAC Rule 3745-66-12.

The amended closure plan submitted to Ohio EPA on December 19, 1991 and revised on May 27, 1993 by Vernitron Piezoelectric is hereby approved with the following modifications:

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SEP 30 93
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I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Christie Mackey Date 9/30/93

Mr. Ron Roch
Vernitron Piezoelectric
September 30, 1993
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I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: [signature] Date 9/30/93

1. **Page 7, Section 4.1:** Section 4.1 of the Revised Amended Closure Plan states that soil samples will be collected using a shelby tube. This section also states that these tubes will be decontaminated between borings and sample depths.

   There is no mention of how these soil samples will be handled preparatory to transporting them to the laboratory. Samples shall either be extruded carefully in the field and placed into sample jars with teflon-lined lids, or the shelby tubes shall be capped at each end and sealed with wax before shipment to the laboratory. The Revised Amended Closure Plan is hereby modified to incorporate this procedure.

2. **Page 20, Section 6.0, Subsection 3b:** The Revised Amended Closure Plan contains the statement: "...the clean criteria for rinseate listed in Section 5.3..."
   The Revised Amended Closure Plan is hereby modified to read: "...the clean criteria for rinseate listed in Section 5.4, Subsection 2c..."

3. **Page 23, Section 9.0 and Appendix G:** The Revised Amended Closure Plan mentions a health based risk assessment in these sections. The clean standards for this Closure Plan have been established in Sections 5.1.1, 5.2.1, 5.4 Subsection 2c, and 6.0 Subsection 3b. If the facility wishes to alter these clean standards with a health based risk assessment, it must submit a formal Amendment to the Closure Plan. This Amendment would then be subject to the public notice process, and formal review by the Ohio EPA.
   The Revised Amended Closure Plan is hereby modified to delete all references to a health based risk assessment.

4. **Page C-3, Section 2:** The Revised Amended Closure Plan contains the statement: " The exact details of construction will be provided to Ohio EPA for approval prior to work start."
   The Revised Amended Closure Plan is hereby modified to read: " The exact details of construction will be provided to Ohio EPA for review prior to work start."

5. **Pages C-4 and C-5, Section 3, and Figure 7, Appendix A:** Figure 7 shows five proposed well locations, however, only four of these locations were referenced in the Ground Water Quality Assessment Plan (GWQAP). Vernitron Piezoelectric shall correct the text in the GWQAP, and submit the corrections to the Ohio EPA's Northeast District Office within thirty days of the Director's approval. The Revised Amended Closure Plan is hereby modified to incorporate these corrections.

6. **Page C-6, Section 3:** Section 3. paragraph 1 of the GWQAP states that soil samples will be collected continuously in advance of the drill bit. However, the next paragraph states that soil samples will be collected at minimum 5 foot intervals for laboratory analysis. Vernitron Piezoelectric shall clarify this section by including the exact depths at which the samples will be collected for laboratory analysis (i.e. 3'-5'or 4'-6'). Vernitron Piezoelectric shall correct the text in the GWQAP, and submit the corrections to the Ohio EPA's Northeast District Office within thirty days of the Director's approval. The Revised Amended Closure Plan is hereby modified to incorporate these corrections.

7. **Page C-6, Section 3 and Appendix J:** The soil description information and some field data sheets indicate that the odor of soil and water samples will be noted.
   A) Ohio EPA does not require this information for Certification of Closure.
   B) Contaminants are present at the site which are toxic by inhalation.
   C) Unknown contaminants may also be present.
   D) The facility's site safety plan calls for well and soil samplers to be protected in Level C protection with respirators.
   Therefore, the Revised Amended Closure Plan is hereby modified to delete all references to observing or recording the odor of sampled material.

8. **Page C-10, Section 4:** The Revised Amended Closure Plan is hereby modified to incorporate the following statement:
   " Purge waters will be collected in drums for sampling and disposal. At a minimum, the wastewater will be analyzed for pH, TCLP lead, and volatile organics. If the wastewater contains TCLP lead greater than or equal to 5.0 mg/L or a detectable concentration of a RCRA-regulated solvent, the wastewater will be disposed of as a hazardous waste at a permitted off-site facility. If the wastewater analysis reveals that the material does not qualify as a listed hazardous waste and possesses no characteristic of a hazardous waste, it will be disposed of properly in accordance with all other applicable regulations.

9. **Table 1 and Table 2, Appendix D:** The compound abbreviations used are not conventional. Commonly, trichloroethylene is abbreviated as TCE, not TRC and tetrachloroethylene is abbreviated PCE (for perchloroethylene) instead of TTC. The abbreviation MCL used for methylene chloride may be confused with the maximum contaminant level (MCL) in drinking water

Mr. Ron Roch
Vernitron Piezoelectric
September 30, 1993
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standards. Dichloromethane (DCM) is preferred. Vernitron Piezoelectric shall correct the abbreviations used in these tables, and submit the corrections to the Ohio EPA's Northeast District Office within thirty days of the Director's approval. The Revised Amended Closure Plan is hereby modified to incorporate these corrections.

10. **General Modification:** It is stated in the GWQAP that ground water samples will be collected at a depth of 12 feet along an assumed boundary of detectable VOC concentrations using the GEOPROBE method. It is also stated that all ground water samples will be analyzed on-site with a mobile laboratory grade gas chromatograph. Field testing of the ground water will continue until all samples show no detectable VOC concentrations. Monitoring wells MW-5, MW-6, and MW-7, will then be installed downgradient from this established boundary at a distance of approximately 10-20 feet.

MW-4 will be installed at least 50 feet upgradient from the established contamination boundary and to the northeast of the investigation area. All proposed wells shall be included in Figure 7.

This method appears to be valid for the placement of the shallow wells and for the determination of ground water flow gradients in the upper glacial aquifer. However, information on ground water direction and gradient in the confined Berea aquifer cannot be obtained by the installation of shallow wells.

Section 6.0 of the GWQAP states that a private well screened in the Berea Sandstone will be located and permission obtained from owner for use as a test drawdown well. The Revised Amended Closure Plan is hereby modified to delete this statement, and any other relevant text, since information on the installation and construction of private wells is often very poor. Also, it is quite possible that draw downs would not be observed in the shallow wells. This situation would occur if the interval between the shallow and deep screened zones is less than 100% saturated.

The pump test and the installation of one or more deep bedrock wells shall be delayed until the horizontal extent and rate of contamination in the upper aquifer is fully defined. At this time, Vernitron Piezoelectric shall submit a revision to the GWQAP portion of the Revised Amended Closure Plan detailing:

A) Results of the investigation to determine the horizontal extent and rate of contamination in the upper aquifer, and B) A detailed proposal for assessing the impact of the RCRA unit, if any, and the quality of the confined Berea aquifer.

The Revised Amended Closure Plan is hereby modified to incorporate these comments and modifications.

Please be advised that approval of this amended closure plan does not release Vernitron Piezoelectric from any responsibilities as required under the Hazardous and Solid Waste Amendments of 1984 regarding corrective action for all releases of hazardous waste or constituents from any solid waste management unit, regardless of the time at which waste was placed in the unit.

Notwithstanding compliance with the terms of the closure plan, the Director may, on the basis of any information that there is or has been a release of hazardous waste, hazardous constituents, or hazardous substances into the environment, issue an order pursuant to Section 3734.20 et seq of the Revised Code or Chapters 3734 or 6111 of the Revised Code requiring corrective action or such other response as deemed necessary; or initiate appropriate action; or seek any appropriate legal or equitable remedies to abate pollution or contamination or to protect public health or safety or the environment.

Nothing here shall waive the right of the Director to take action beyond the terms of the closure plan pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. 9601 et seq, as amended by the Superfund Amendments and Reauthorization Act of 1986, Pub. L. 99-499 ("CERCLA") or to take any other action pursuant to applicable Federal or State law, including but not limited to the right to issue a permit with terms and conditions requiring corrective action pursuant to Chapters 3734 or 6111 of the Revised Code; the right to seek injunctive relief, monetary penalties and punitive damages, to undertake any removal, remedial, and/or response action relating to the facility, and to seek recovery for any costs incurred by the Director in undertaking such actions.

You are notified that this action of the Director is final and may be appealed to the Environmental Board of Review pursuant to Section 3745.04 of the Ohio Revised Code. The appeal must be in writing and set forth the action complained of and the ground upon which the appeal is based. It must be filed with the Environmental Board of Review within thirty (30) days after notice of the Director's action. A copy of the appeal must be served on the Director of the Ohio Environmental Protection Agency within three (3) days of filing with the Board. An appeal may be filed with the Environmental Board of Review at the following address: Environmental Board of Review, 236 East Town Street, Room 300, Columbus, Ohio 43266-0557.

When closure is completed, the Ohio Administrative Code Rule 3745-66-15 requires the owner or operator of a facility to submit to the Director of the Ohio EPA, certification by the owner or operator and an independent, registered professional engineer that the facility has been closed in accordance with the approved closure plan. The certification by the owner or operator shall include the statement found in OAC 3745-50-42(D). These certifications should be submitted to: Ohio Environmental Protection Agency, Division of Hazardous Waste Management, Attn: Thomas Crepeau, Data Management Section, P.O. Box 1049, Columbus, Ohio 43266-0149.

Sincerely,

Gerry Lannon for

Donald R. Schregardus
Director

DRS/JP/wk

cc: Tom Crepeau, DHWM Central File, Ohio EPA
Randy Meyer, Ohio EPA, DHWM, CO
Section Chief, Ohio Permit Section, U.S. EPA Region V
John Palmer Ohio EPA, DHWM, NEDO
Todd Fisher, Ohio EPA, DDAGW, NEDO
Harry Courtright, Ohio EPA, DHWM, NEDO

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I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: [illegible signature] Date 9/30/93

OhioEPA
State of Ohio Environmental Protection Agency

P.O. Box 1049, 1800 WaterMark Dr.
Columbus, Ohio 43266-0149
(614) 644-3020
FAX (614) 644-2329

File in Part A. File

George V. Voinovich
Governor

Donald R. Schregardus
Director

CERTIFIED MAIL

NOTICE OF DEFICIENCY

February 13, 1992

Mr. Ron Roch
Vernitron Piezoelectric
232 Forbes Road
Bedford, Ohio 44146

RE: CLOSURE PLAN
Vernitron Piezoelectric
OHD 052 324 290

Dear Mr. Roch:

On December 19, 1989, Ohio EPA received from Vernitron Piezoelectric a closure plan for two hazardous waste storage areas (Line 1, S01), located at 232 Forbes Road, Bedford, Ohio. An additional revision was recieved on June 3, 1991.

This closure plan was submitted pursuant to Rule 3745-66-12 of the Ohio Administrative Code (OAC) in order to demonstrate that Vernitron Piezoelectric's proposal for closure complies with the requirements of OAC Rules 3745-66-11 and 3745-66-12.

The public was given the opportunity to submit written comments regarding the closure plan in accordance with OAC Rule 3745-66-12. The public comment period extended from June 11, 1990 through July 17, 1990. No public comments were received by Ohio EPA.

Pursuant to OAC Rule 3745-66-12(D)(4), I am providing you with a statement of deficiencies in the plan, outlined in Attachment A.

Please be advised that OAC Rule 3745-66-12 requires that a modified closure plan addressing the deficiencies enumerated in Attachment A be submitted to the Director of the Ohio EPA for approval within thirty (30) days of the receipt of this letter.

The modified closure plan shall be in accordance with the following editorial protocol or convention:

1. Old Language is over-struck, but not obliterated.

2. New Language is capitalized.

3. Page headers should indicate date of submission.

4. If significant changes are necessary, pages should be re-numbered, table of contents revised, and complete sections provided as required.

The modified closure plan should be submitted to: Ohio Environmental Protection Agency, Division of Hazardous Waste Management, Attn: Thomas Crepeau, Manager, Data Management Section, P.O. Box 1049, Columbus, Ohio 43266-0149. A copy should also be sent to: John Palmer, Ohio EPA, Northeast District Office, 2110 East Aurora Road, Twinsburg, Ohio 44087.

Upon review of the resubmitted plan, I will prepare and issue a final action approving or modifying such plan. If you wish to arrange a meeting to discuss your responses to this Notice of Deficiency, please contact Paul Vandermeer, Ohio EPA, DHWM, Central Office (614) 644-2956 or John Palmer at (216) 425-9171.

Sincerely,

Donald R Schregardus

Donald R. Schregardus
Director

DRS/PV/pas

cc: Tom Crepeau, DHWM, Central File, Ohio EPA
Lisa Pierard, USEPA, Region V
Joel Morbito, USEPA, Region V
John Palmer, Ohio EPA, NEDO
Paul Vandermeer, CO, Ohio EPA

ATTACHMENT A

1. **General Comment.**

During the closure, Vernitron Piezoelectric (Vernitron) shall submit a monthly report to the Ohio EPA's Northeast District Office, Division of Hazardous Waste Management which outlines the current closure activity for the unit, describes any problems encountered during the closure proceedings, and identifies the next month's anticipated events to be performed during closure activities. A monthly report shall be due 30 days from the date of the Director's approval and thereafter on 30 day intervals until the final closure/post-closure certification report is submitted.

2. **Section 4.2, Ground Water Assessment Plan.**

Groundwater data collected to date indicate that there has been a release of hazardous waste and/or hazardous waste constituents into the groundwater at the Vernitron Piezoelectric site. Before final closure of the facility, Vernitron shall develop and implement a groundwater quality assessment plan in accordance with OAC 3745-65-93 to determine the full rate, extent and concentration of hazardous wastes and hazardous waste constituents in the groundwater as required by OAC 3745-65-93(D)(4)(a) and (b). The plan shall include a sampling and analysis plan which meets the requirements of OAC 3745-65-92. The assessment plan also shall address specific concerns and deficiencies noted during the review of the groundwater portion of the Amended Closure Plan received June 3, 1991 (See Comment Nos. 3 through 18 below).

3. **Section 4.2, Ground Water Assessment Plan.**

Water well logs used to determine that the Orangeville Shale under the site is 96 feet deep shall be submitted to the Ohio EPA. In addition, well logs for all private and public water supplies within 2,000 feet of the facility also shall be submitted to the Ohio EPA in the revised closure plan.

4. **Section 4.2, Ground Water Assessment Plan.**

The following information concerning the drilling and installation of the original three monitor wells at the site shall be submitted to the Ohio EPA in the revised closure plan:

a. The reason why the original boring at location 62 was abandoned and details of the procedures employed in plugging and abandoning the original boring;

b. All details of how the wells were drilled, including but not limited to, the method of drilling, how the wells were logged, the sampling and/or logging interval, and drilling fluids if any which were used;

c. The specific standards used to determine when the wells were sufficiently developed; and

d. The screen slot size, the type of sand used in the annular space, and the mixing proportions of cement to bentonite used in preparing the grout for the well annular space.

5. **Section 4.2, Ground Water Assessment Plan.**

Abandonment procedures for the boreholes resulting from the collection of groundwater samples for field analysis shall be submitted to the Ohio EPA in the revised closure plan.

6. **Section 4.2, Ground Water Assessment Plan.**

All details of the proposed laboratory permeability test shall be presented and must include, but not be limited to, the procedures to be employed to ensure that the sample will be obtained and loaded into the permeameter in an undisturbed condition, the type of permeability test to be run, the apparatus to be used and the method of data evaluation to be employed.

7. **Section 4.2, Ground Water Assessment Plan.**

   The groundwater quality assessment plan shall include provisions for continuous split spoon sampling for geologic logging purposes during the drilling of the proposed monitor wells.

8. **Section 4.2, Ground Water Assessment Plan.**

   Water level elevation and well depth measurements shall be made prior to purging and sampling of each well. Water level elevation data shall be evaluated to determine if groundwater flow direction changes due to temporal or seasonal variations.

9. **Section 4.2, Ground Water Assessment Plan.**

   An interface probe shall be used to detect immiscible layers (both Dense Non-Aqueous Phase Liquids [DNAPLs] and Light Non-Aqueous Phase Liquids [LNAPLs]) before each well is purged. If immiscible layers are detected, they shall be sampled before the wells are purged.

10. **Section 4.2, Ground Water Assessment Plan.**

    Vernitron shall provide the proportion of cement to bentonite to be used in mixing the grout for the well annular space. The method of grouting the well also shall be detailed. In addition, the well construction shall be changed to provide for expanding cement in the annular space from below the frost line and extending out on the surface into a cement apron around the well head.

11. **Section 4.2, Ground Water Assessment Plan.**

    Vernitron proposes to install flush mounted wells at the site. Flush mounted wells are not acceptable. Wells shall be finished above grade and shall have steel bumper guards installed around them. Figure 6, Appendix A of the closure plan should be modified to reflect these changes in well construction. Vernitron shall also provide all details regarding the construction of the monitor wells.

12. **Section 4.2, Ground Water Assessment Plan.**

Well logs resulting from the drilling of the proposed wells shall be submitted to the Ohio Department of Natural Resources.

13. **Section 4.2, Ground Water Assessment Plan.**

Details of well development and purging including the method of development (bailer, surge block, pump, including the type of pump) and the criteria to be used to determine when the wells are sufficiently developed shall be included in the sampling and analysis plan portion of the groundwater quality assessment plan.

14. **Section 4.2, Ground Water Assessment Plan.**

Details regarding the decontamination of sampling and drilling equipment shall be included in the groundwater quality assessment plan.

15. **Section 4.2, Ground Water Assessment Plan.**

Groundwater samples for lead analyses shall be field filtered at the well head at the time of sampling using a 0.45 um filter and immediately field acidified to a $pH < 2$ with HNO_3. Details of this shall be included in the sampling and analysis plan portion of the groundwater quality assessment plan. In addition, the company shall use the method of analysis with the lowest analytical detection limit. The actual detection limit achieved by the lab shall be included with the lab data sheets when the results of analyses are submitted to the Ohio EPA.

16. **Section 4.2, Ground Water Assessment Plan.**

The exact laboratory analytical method and detection limit for each parameter to be analyzed shall be tabulated and documented in the sampling and analysis plan portion of the groundwater assessment plan.

17. **Section 4.2, Ground Water Assessment Plan.**

The sampling and analysis plan portion of the groundwater quality assessment plan shall include provisions for the collection and analysis of duplicate samples.

18. **Section 4.2, Ground Water Assessment Plan.**

Vernitron proposes to monitor for VOCs on a quarterly basis. Provision shall be made to continue the quarterly sampling events for a minimum of three years. The company also shall monitor for lead on a quarterly basis for at least three years.

19. **Section 5.1.1, Clean Closure Standards.**

Vernitron proposes to remediate contaminated soils and ground water containing organic compounds and lead. However, clean closure of this site will take some time, probably more than 30 months. Vernitron shall therefore close the site as a landfill with remediation activities occurring under the auspices of the post-closure care period. If, during post-closure care, Vernitron can demonstrate clean closure, then it may petition the Director of Ohio EPA to be freed from the post-closure care obligation. In addition, Vernitron will not be required to place a RCRA landfill cap on the closure unit immediately; however, Vernitron must still comply with OAC 3745-68-10. If at some later time Vernitron cannot complete clean closure, then a landfill cap shall be required. Also, Ohio EPA reserves the right to require a RCRA cap if remedial activities prove to be ineffective or to ensure protection of human health and the environment.

20. **Section 5.1.2, Vapor Extraction With Ground Water Recovery.**

The proposed vapor extraction pilot study proposed in this section and in Appendix E has important information that is not included. Attached to this letter is a document entitled "Conducting Field Tests for Evaluation of Soil Vacuum Extraction Application." Vernitron shall use this document to redesign their pilot study and resubmit a revised pilot study to Ohio EPA within 30 days of the receipt of this letter.

21. **Section 5.2.1, Clean Closure Standard.**

Vernitron proposes a clean standard for lead in the 0-12" layer of soil of 257 ppm. This is not an acceptable because Vernitron has not demonstrated that lead is indeed a sitewide contaminant at this elevated concentration, and because it is greater than the risk-based interim standard of 150 ppm in soils. Since Vernitron cannot provide good evidence for this background concentration for lead in the 0-12" layer of soil, the 150 ppm clean standard shall be included in the closure plan as the clean standard for the 0-12" soil layer as long as the soil does not exhibit the characteristic of a hazardous waste at this 150 ppm concentration.

22. **Section 5.2.2, Excavation and Disposal.**

Vernitron mentions stockpiling excavated, contaminated soils on a plastic liner and covering the pile with plastic. This activity is not allowed as it results in the creation of an illegal hazardous waste pile. Vernitron must containerize all contaminated soils excavated at the site. The closure plan is hereby amended to state that contaminated soils shall be containerized. The reference to creation of the illegal waste pile is hereby deleted.

23. **Section 5.3, Site Restoration.**

The closure plan is hereby amended to state that the rinseate clean standards for effective decontamination of the storage pads (both outside and inside) are as follows:

a. Fifteen times the public drinking water maximum contaminant level (MCL) for hazardous waste constituents as promulgated in 40 CFR 141.11 and OAC 3745-81-11 for inorganics and 40 CFR 141.12 and OAC 3745-81-12 for organics;

b. If an MCL is not available for a particular contaminant, then fifteen times the maximum contaminant level goal (MCLG) as promulgated in 40 CFR 141.50 shall be used as the clean standard; or

c. If the product of fifteen times the MCL or MCLG exceeds 1 mg/l or if neither an MCL nor an MCLG is available for a particular contaminant, then 1 mg/l shall be used as the clean standard.

RECEIVED
OHIO EPA

MAY 29 1990

DIV. of SOLID & HAZ. WASTE MGT.

CONDUCTING FIELD TESTS FOR EVALUATION OF SOIL VACUUM EXTRACTION APPLICATION

Dominic C. DiGiulio and Jong Soo Cho, Ph.D.
U.S. Environmental Protection Agency Robert S. Kerr Environmental Research Laboratory
Superfund Technology Support Center P.O. Box 1198 Ada, Oklahoma 74820

R. Ryan Dupont, Ph.D. and Marian W. Kemblowski, Ph.D.
Department of Civil and Environmental Engineering
Utah Water Research Laboratory Utah State University

ABSTRACT

The application of soil vacuum extraction (SVE) is conceptually simple. Its success however, depends on an understanding of complex subsurface physical, chemical, and biological processes which unfortunately are seldom appreciated. This is evident in the execution of many field or pilot scale tests which often do not generate data applicable at other sites or which provide insight into the ability of SVE to remediate soils to stipulated soil based performance standards within a reasonable period of time. This paper provides recommendations in designing field tests to evaluate the applicability and limitations of soil vacuum extraction under various soil-contaminant conditions.

INTRODUCTION

The ability of soil vacuum extraction (SVE) to inexpensively remove large amounts of VOCs from contaminated soils has been demonstrated repeatedly in published case studies. However, the ability and time required using SVE to remediate soils to low contaminant levels often required by state and federal regulators has not been adequately investigated. Most field studies verify the ability of an SVE system to circulate air in the subsurface and remove, at least initially, a large mass of VOCs. They do not generally provide insight into mass transport limitations which eventually limit SVE performance, nor do field studies generally evaluate methods such as enhanced biodegradation which may optimize overall contaminant removal. Discussion is presented to aid in conducting field tests which better assess SVE limitations and methods to optimize SVE application.

DETERMINING CONTAMINANT VOLATILITY

The first step in evaluating the feasibility of SVE application at a hazardous waste site is to assess contaminant volatility. If concentrations of VOCs are relatively low and the magnitude of anthropogenic organic carbon (e.g., waste oil) present in the soil is negligible, VOCs can ... to exist in a three-phase system (i.e., air, water, and soil), as illustrated in Figu... are sufficiently moist, relative volatility in a three-phase system can be estima... ation (1) which incorporates the effects of air-water partitioning (Henry's constant, ... (soil-water partition coefficient).

$$C_g/C_t = 1/(\ldots K_h) + \theta/K_h + a)) \quad (1)$$

where:

C_g/C_t = Relative Vapor C... n ($mg/cm^3_{air}/mg/cm^3_{soil}$)
ρ_g = Bulk Density (g/cm...
K_{oc} = Organic Carbon-Water Partition Coefficient (cm^3/g)
f_{oc} = Fraction of organic carbon content (g/g)
K_h = Henry's Constant ($mg/cm^3_{air}/mg/cm^3_{water}$)
θ = Volumetric Moisture Content (cm^3/cm^3)
a = Volumetric Air Content (cm^3/cm^3)

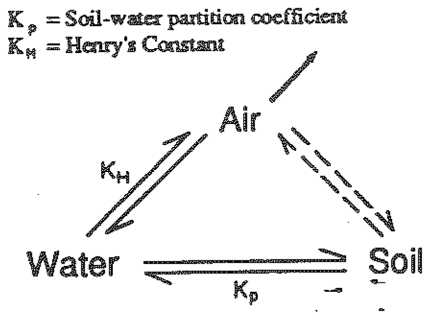

Figure 1. Three phase system.

Caution must be exercised when using this approach since this relationship was based on the assumption that soil organic carbon content is greater than 0.1% and the organic carbon is of natural humic origin. The former assumption is frequently invalid in soils below the root zone, while the latter assumption may often be invalid at hazardous waste sites in which organic carbon is of anthropogenic origin.

This approach would also not be valid when soils are extremely dry. Soil moisture may decrease as air is circulated through soil since water has a vapor pressure of 10 mm Hg at typical soil temperatures. As illustrated in Figure 2, under low soil moisture conditions, VOC vapors adsorb directly on soil surfaces where fewer water molecules are competing for adsorption sites. This increases the magnitude of sorption greatly, thus drastically reducing volatilization (9). This effect is be reversible however when soil moisture is increased. The moisture content at which a decrease in vapor density becomes apparent is often termed the critical moisture content and is generally defined as being equivalent to a monolayer of water molecules coating the soil particles (9).

The effect of soil moisture content on vapor sorption is rarely investigated at vacuum extraction sites, thus its importance is difficult to assess. Johnson and Sterrett (1988) noted that offgas dichloropropane concentrations were statistically correlated with ambient air moisture during SVE operation in Benson, Arizona. While direct sorption of vapors on soil surfaces would appear more likely in arid areas, it could conceivably be important in temperate areas during warm dry summers. The effect of

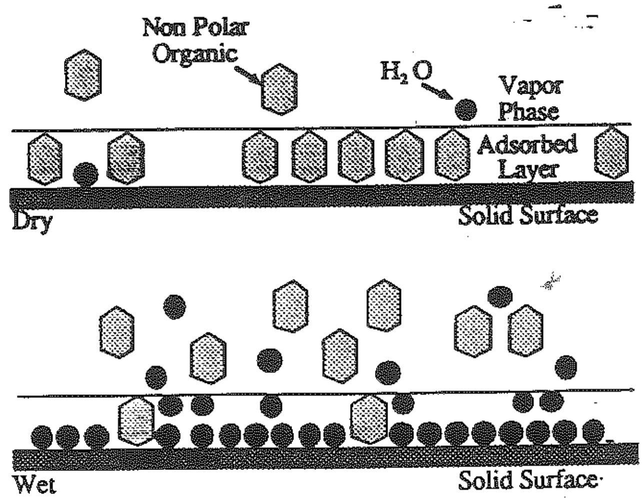

Figure 2. Voc adsorption with two moisture regimes.

moisture content on contaminant volatility can be assessed by monitoring VOC concentrations in vapor observation wells with concurrent in-situ measurement of moisture content or matric potential (e.g., neutron probes, tensiometers) in adjacent soils. If a site is to be covered in an attempt to induce greater lateral subsurface air flow, the effect of the cover on contaminant volatility through elimination of infiltration and subsequent decrease in soil moisture content should be monitored over time, especially in arid areas.

If soils are visibly contaminated or the presence of immiscible fluids is suspected in soils based on high contaminant, total organic carbon, or total petroleum hydrocarbon analysis, contaminants are likely present in a four phase system as illustrated in Figure 3. Under these circumstances, most of the VOC mass will be associated with the immiscible fluid and assuming that the fluid acts as an ideal solution, volatilization will be governed by Raoult's Law.

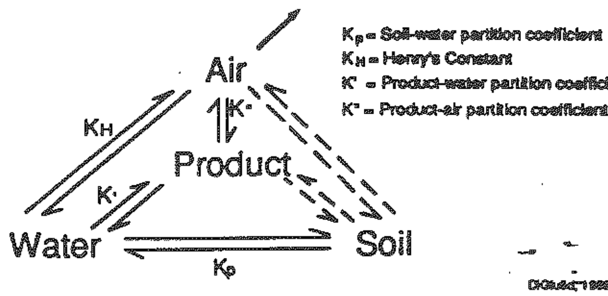

Figure 3. Four phase system.

$$P_a = X_a P^o_a \qquad (2)$$

where:

P_a = vapor pressure of component over solution (mm Hg)
X_a = mole fraction of component in solution
P^o_a = vapor pressure of pure component (mm Hg)

In a four-phase system, contaminant volatility will be governed by the VOC's vapor pressure and mole fraction within the immiscible fluid. The vapor pressure of many compounds increases substantially with an increase in temperature while solubility in a solvent phase is much less affected by temperature. This suggests that soil temperature should be taken into account when evaluating VOC recovery for contaminants located near the soil surface (seasonal variations in soil temperature quickly dampen with depth). For instance, if conducting a field test to evaluate potential remediation of shallow soil contamination in the winter, one should realize that VOC recovery could be substantially higher during summer months, and low recovery should not necessarily be viewed as SVE system failure.

As vacuum extraction proceeds, lower molecular weight organic compounds will preferentially volatilize and degrade. This process is commonly described as weathering and has been examined both theoretically (1) and in laboratory experiments (6). In the latter, samples of gasoline were sparged with air and the concentration and composition of vapors were monitored. Figure 4 illustrates the normalized concentrations of a variety of gasoline constituents as a function of the fractional volume of gasoline remaining in the study. The efficiency of vapor extraction decreased to less than 1% of its initial value even though approximately 40% of the gasoline remained. The normalized concentration of less volatile compounds (i.e., toluene) increased as shown in Figure 4, due to an increase in their mole fractions in residual gasoline as the more-volatile components were removed. Theoretical and experimental work on product weathering indicate the need to monitor specific VOCs of concern in extraction and observation wells when attempting to evaluate the rate of removal of specific compounds since their removal cannot be inferred directly from total VOC or total hydrocarbon measurements.

When assessing contaminant volatility then, one should determine whether volatility is controlled by a compound's Henry's Law Constant and soil-water partition coefficient or by its vapor pressure and mole fraction in an immiscible fluid (i.e., Raoult's Law). Soils contaminated by <u>bulk</u> spillage of compound classes such as ketones, ethers, and alcohols ca[illegible]mediated using SVE, c[illegible]what one would expect using Henry's Constants or C_g/C_l values, because of their hi[illegible]por pressures and likely presence in soil as a separate phase. Timely remediation is essential for these types of compounds, however, because of their high solubility and unretarded transport through soil.

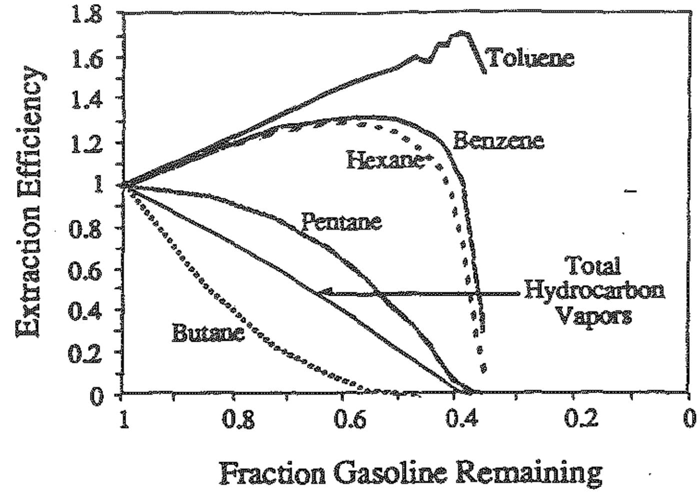

Figure 4. Fraction gasoline remaining vs. extraction efficiency.

EVALUATING AIR FLOW

Air permeability (k_a) in soil is a function of a soil's intrinsic permeability (k_i) and liquid content. At hazardous waste sites, liquid present in soil pores is often a combination of soil water and immiscible fluids. Air permeability (k_a) can be estimated by multiplying a soil is intrinsic permeability (k_i) (cm^2)by the relative permeability (k_r).

$$k_a = k_i \; k_r \quad (3)$$

k_r is a dimensionless ratio varying from one to zero describing the variation in air permeability as a function of air saturation. Equations developed by Brooks and Corey (1964) and Van Genuchten (1980) are useful in estimating air permeability as a function of air saturation or liquid content. Brooks and Corey's equation to estimate relative permeability of a non-wetting fluid (i.e. air) is given by:

$$k_r = (1 - S_e)^2 \; (1 - S_e^{2+\lambda/\lambda}) \quad (4)$$

where:

$S = \theta/\varepsilon$,
$S_e = (S - S_r)/(1-S_r)$ (5)
S = degree of saturation of wetting fluid
θ = volumetric moisture content
ε = total porosity
S_r = residual saturation
S_e = effective saturation
λ = pore size distribution parameter

The pore size distribution parameter and residual saturation can be estimated using soil-water characteristic curves which relate matric potential to volumetric water content. When initially developing an estimate of relative permeability for a given soil texture and liquid content, values for ε, S_r, S_e, and λ can be obtained from the literature. Rawls et al. (1982) summarized geometric and arithmetic means for Brook and Corey parameters for various USDA soil textural classes. Figure 5 illustrates relative permeability as a function of volumetric moisture content for clayey soils assuming $\varepsilon = 0.475$, $S_r = 0.090$, and $\lambda = 0.131$.

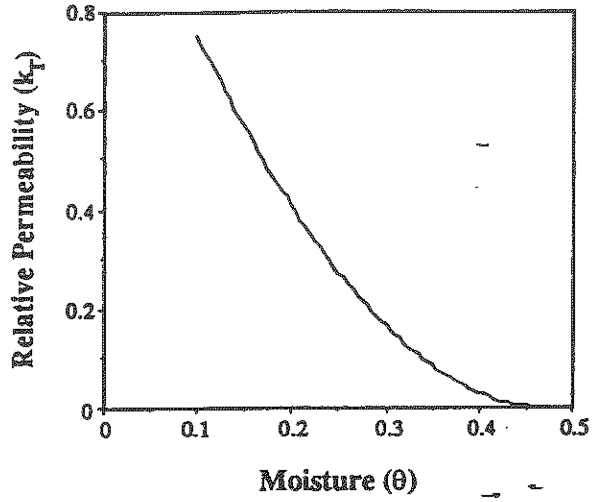

Figure 5. Moisture vs. relative permeability of clay.

Claims have been made that remediation of clayey soils is possible using vacuum extraction (10). Effective air circulation in clayey soil, though at least in primary porosity, would appear unlikely. It seems more likely that airflow in clayey soil is primary through secondary porosity. Generally, soils with high intrinsic permeabilities are more likely to be vented effectively due both to the rapidity and uniformity of air flow. In less permeable media, such as glacial till and clayey soils, secondary permeability or porosity (i.e. fractures) will dominate air flow. This will result in relatively rapid removal of VOCs present in preferential flow areas with much slower removal in areas of lower permeability.

The most effective method of measuring air permeability is by conducting a field pneumatic pump test. Using permeameters or other laboratory measurements may provide deceptive results as laboratory measurement of air flow in clay may indicate little or no flow and lead one to believe that vacuum extraction of clayey soils is infeasible because no macropore flow is observed. Information gained from pneumatic pump tests is vital in determining site-specific design considerations (e.g., spacing of extraction wells). Selecting the placement and screened intervals of extraction and observation wells and applied vacuum rates during a pump test is often based on prior information obtained from other sites, intuition, and trial and error. While it is acknowledged that this approach is often necessary, the proper use of appropriate mathematical models may aid, at least initially, in SVE field test design. The similarity of fluid flow processes of air and water in porous medium suggests the use of ground water flow models. Three-dimensional ground water flow models may be preferred over two-dimensional models when air flow in soil has a substantial vertical velocity component. When considering the use of ground water models in estimating air flow, the user should be aware that the differential equations governing pressure induced flow of gas in soil are nonlinear because of gas density dependency on pressure, while linear differential equations are typically utilized in ground water flow models. This does not introduce significant errors into flow and transport estimates however, until pressure differential exceeds 0.5 atmospheres (7), a much higher vacuum than normally required for flow and vacuum propagation in unconsolidated medium. However, even in soils in which vacuum is applied at greater than 0.5 atm, static transient vacuum measurements at short distances from the extraction well will be well below 0.5 atm.

EVALUATING MASS TRANSFER LIMITATIONS AND REMEDIATION TIME

The effects of mass transport limitations are usually manifested by a substantial drop in soil vapor contaminant concentrations as illustrated in Figure 6 or by an asymptotic increase in total mass removal with operation time. Typically, when venting is terminated, an increase in soil gas concentration is observed over time. Slow mass transfer with respect to advective air flow is most likely caused by diffusive release from differences in permeability in the column due to soil stratigraphic characteristics, as illustrated in Figure 7 or diffusive release from porous aggregate structures or lenses of lesser permeability as illustrated in Figure 8. The time required for the remediation of heterogeneous and fractured soils depends directly on the proportion of contaminated material exposed to bulk airflow. It would be expected that the long-term performance of SVE will be limited to a large degree by gaseous and liquid diffusion from soil regions not exposed to direct airflow. Since effective gaseous diffusion is approximately 10,000 times faster than liquid diffusion, remediation of clayey soils may be enhanced by decreasing moisture content to maximize gaseous diffusion.

Regardless of possible causes, the significance of mass transport limitations should be evaluated during SVE field tests. This can be achieved by isolating a small area of a site and aggressively applying vacuum extraction until mass transport limitations (i.e., Figure 6) are realized. Isolation can be achieved by surrounding extraction wells with passive inlet wells as shown in Figure 9 to short-circuit vacuum propagation. Quantifying the effects of mass transport limitations on remediation time might

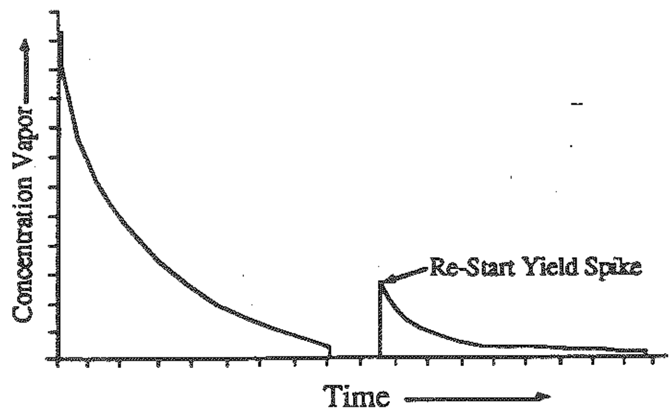

Figure 6. Concentration vs. time profile.

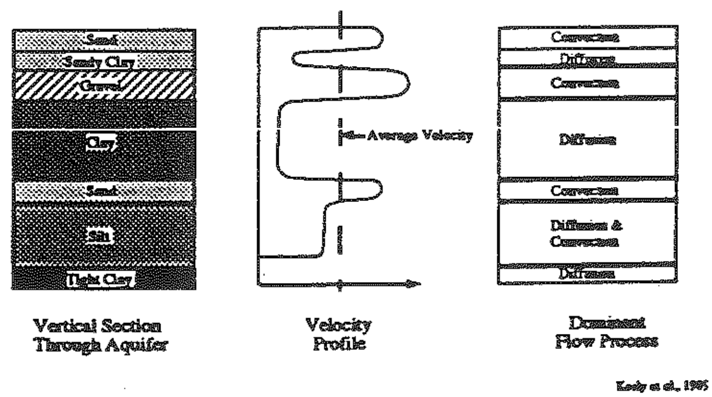

Figure 7. Effect of geologic stratification on tailing.

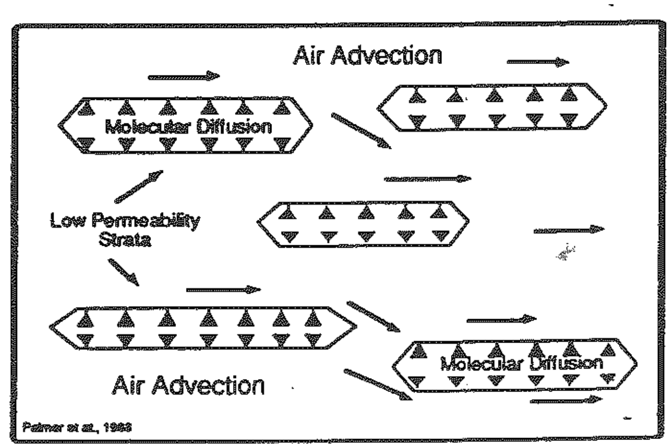

Figure 8. Diffusion release of contaminants.

then be attempted by utilizing models incorporating mass transfer rate coefficients. However, using models to estimate remediation time is anything but straightforward.

Some practitioners (10) have attempted to estimate the required remediation time by extrapolating observed extraction well offgas concentrations to a desired soil level. This is accomplished by using the contaminant's Henry's Law Constant and soil-water partition coefficient to calculate a soil-gas concentration in equilibrium with a desired final total soil concentration. As shown in Figure 10, the remediation time required to meet an equivalent soil-gas concentration is estimated by extrapolating observed extraction well offgas concentrations to the soil-gas equilibrium valve at some point in time. While observation of extraction well offgas concentrations may provide an overall indication of SVE operation, the use offgas concentrations to estimate remediation time appears questionable because:

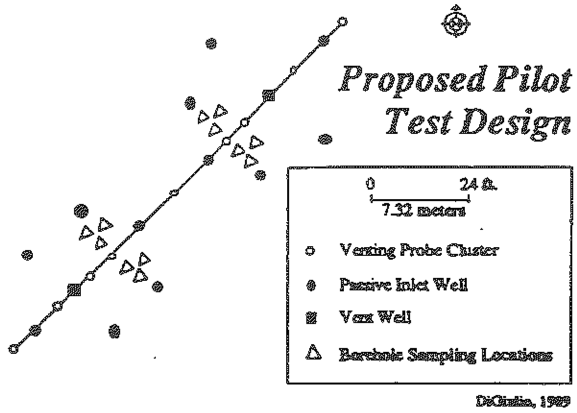

Figure 9. Proposed pilot test flight.

1. it is assumed that contaminant volatility is controlled by Henry's constant and a soil-water partition coefficient, the limitations of which were previously discussed;

2. the method does not account for air phase VOC re-equilibration caused by mass transport limitations typically observed in extraction and observation wells at cessation of vacuum application, thus providing a false indication of remediation; and

3. this procedure utilizes averaged gaseous concentration levels from actively operating extraction wells drawing air from large volumes of soil. Thus gas levels represent integrated volumes rather than discrete areas as often required by regulators.

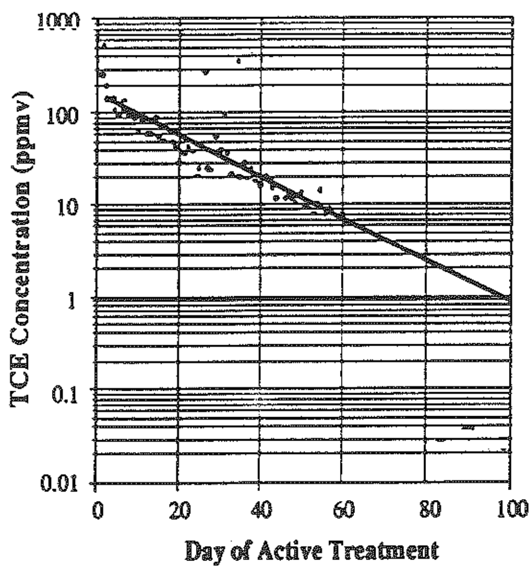

Figure 10. Wellhead TCE concentration vs. time.

The discrepancy frequently observed between mass removal predicted from equilibrium conditions using Henry's Law constants and that observed from laboratory column and field studies is sometimes reconciled by the use of "effective or lumped" soil-air partition coefficients. These parameters are determined from laboratory column tests and are then used for model input to determine required remediation times. While this method does indirectly account for mass transport limitations, problems may arise when one attempts to quantitatively describe several processes with lumped parameters. One primary concern is whether the lumped parameter is suitable for use only under the laboratory conditions in which it was applied, or whether it can be transferred for modeling use in the field.

The most direct method of accounting for mass transport limitations is to incorporate mass transfer coefficients directly into convective-dispersive vapor transport models. While vapor transport models incorporating mass transfer coefficients are currently not available, model development in this area is expected to occur relatively quickly.

ENHANCED AEROBIC BIODEGRADATION

With the exception of a few field research projects, soil vacuum extraction has been applied primarily for removal of volatile organic compounds from the vadose zone. However, circulation of air in soils can be expected to enhance the aerobic biodegradation of both volatile and semivolatile organic compounds. One of the most promising uses of this technology is in manipulating subsurface oxygen levels to maximize in-situ biodegradation. Bioventing can reduce vapor treatment costs and can result in the remediation of semivolatile organic compounds which cannot be removed by physical stripping alone.

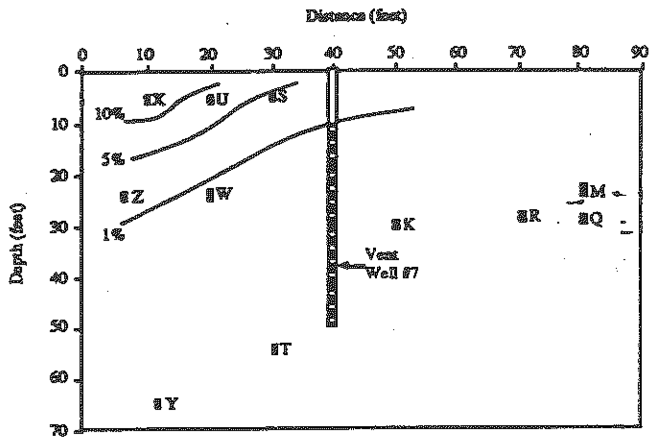

Figure 11. Oxygen concentration in vadose zone before venting.

SVE circulates air in soils at depths much greater than are possible by tilling, and oxygen transport via the gas phase is much more effective than injecting or flooding soils with oxygen saturated liquid solutions. It is also possible that enhanced biodegradation of semivolatiles may increase the volatilization of VOCs through the biodegradation of oily material with which the VOCs are associated.

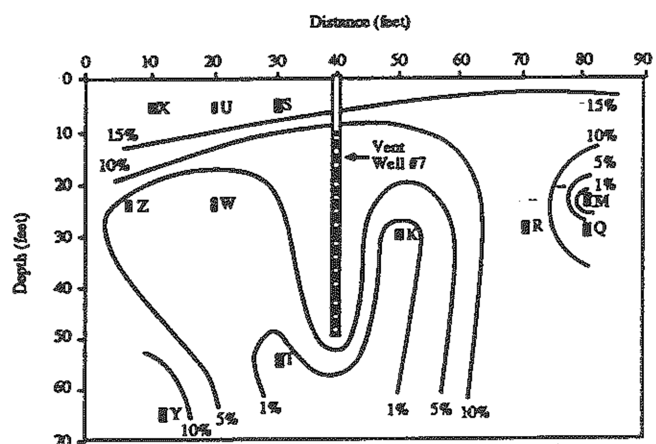

Figure 12. Oxygen concentration in vadose zone after venting.

Hinchee (1989) described the use of soil vacuum extraction at Hill AFB, Utah for oxygenation of the subsurface and the enhancement of biodegradation of petroleum hydrocarbons in soils contaminated with JP-4 jet fuel. Figures 11 and 12 illustrate subsurface oxygen profiles at the Hill site prior to and during SVE. It is evident that soil oxygen levels dramatically increased following one week of venting. Soil vapor samples collected from observation wells during periodic vent system shutdown revealed rapid decreases in oxygen concentration and corresponding CO_2 production verifying that aerobic biodegradation was indeed occurring at the site. Laboratory treatability studies using soils from the site demonstrated increased carbon-dioxide evolution with increasing moisture content when enriched with nutrients. It is worthwhile to note that soils at Hill AFB were relatively dry at commencement of field vacuum extraction indicating, that the addition of moisture could perhaps stimulate aerobic biodegradation even further under field operating conditions.

When conducting site characterization and field studies, it is recommended that CO_2 and O_2 levels be monitored in soil vapor probes and extraction well offgas to allow the assessment of basal soil respiration and the effects of site management on subsurface biological activity. These measurements are simple and inexpensive to conduct and can yield a wealth of information regarding:

1. the mass of VOCs and semivolatiles which have undergone biodegradation versus volatilization. This information is crucial if subsurface conditions (e.g., moisture content) are to be manipulated to enhance biodegradation to reduce VOC offgas treatment costs and maximize semivolatile removal,

2. factors limiting biodegradation. If O_2 and CO_2 monitoring reveals low O_2 consumption and CO_2 generation while readily biodegradable compounds persist in soils, further characterization studies could be conducted to determine if biodegradation is being limited by insufficient moisture content, toxicity (e.g. metals), nutrients, etc.

3. subsurface air flow characteristics. Observation wells which indicate persistent, low O_2 levels indicate an insufficient supply of soil gas at that location suggesting the need for higher extraction well vacuum, the need for additional extraction wells, or additional soils characterization information to identify areas with high moisture content or where immiscible fluids impede the flow of air. In this instance, it may be necessary to place a high density of extraction wells with corresponding high applied vacuum and possibly even the use of injection wells to induce air flow in selected soil areas.

LOCATION AND NUMBER OF VAPOR EXTRACTION WELLS

One of the primary objectives in conducting a SVE field test is to evaluate the initial placement of extraction wells to optimize VOC removal from soil. Placement of extraction wells and selected applied vacuum is largely an iterative process requiring continual re-evaluation as additional data are collected during remediation. Vacuum extraction wells produce complex three-dimensional reduced pressure zones in affected soils. The size and configuration of this affected volume depends on the applied vacuum, venting geometry (e.g., depth to water table), soil heterogeneity, and intrinsic (e.g., permeability) and dynamic (e.g., moisture content) properties of the soil. The lateral extent of this reduced pressure zone (beyond which static vacuum is no longer detected) is often termed the radius or zone of influence (ROI). Highly permeable sandy soils typically exhibit large zones of influence and high air flow rates whereas less permeable soils, such as silts and clays, exhibit smaller zones of influence and low air flows.

Measured or anticipated radii of influence are often used to space extraction wells. For instance, if a ROI is measured at 10 feet, extraction wells are placed 20 feet apart. This strategy though is questionable since as illustrated in Figures 13 and 14, vacuum propagation (2) and air velocity (12) decrease substantially with distance from an extraction well. Thus, only a limited volume of soil near an extraction well will be effectively ventilated regardless of the ROI. Johnson and Sterrett (1988) describe how the addition of 13 extraction wells within the ROI of other extraction wells increased blower VOC concentration by 4000 ppmv and mass removal by 40 kg/day. They concluded that the radius of influence was not an effective parameter for locating extraction wells and that operation costs could be reduced by increasing the number of extraction wells as opposed to pumping at higher rates with fewer wells.

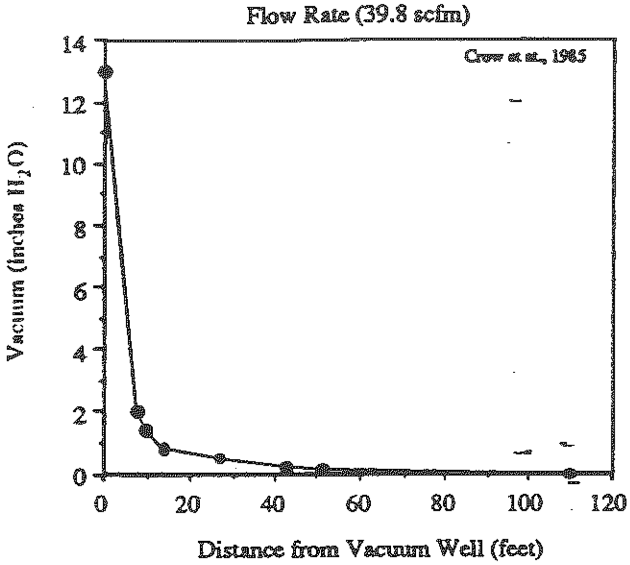

Figure 13. Vacuum vs. Distance from vacuum well.

Determining the propagation of induced vacuum requires conducting pneumatic pump tests in which variation in static vacuum is measured in vapor observation wells at depth and distance from extraction wells. Locating extraction and observation wells along transects as illustrated in Figure 9 minimizes the number of observation wells necessary to evaluate vacuum propagation at linear distances from extraction wells. Pressure differential can be observed at greater distances than would otherwise be possible in other configuration.

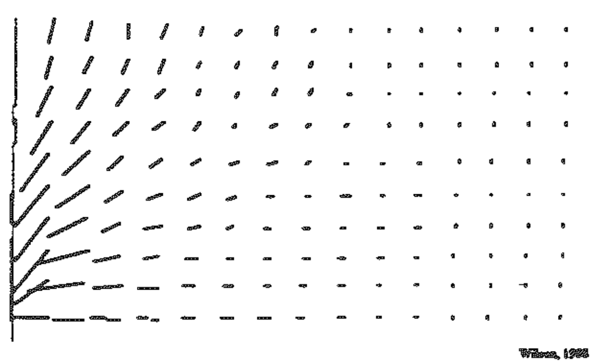

Figure 14. Air velocity field near an extraction well.

Propagation of vacuum in soils as a function of applied vacuum can be determined by conducting pneumatic pump tests with incrementally increasing flow or applied vacuum. Vacuum is increased after steady state conditions (relatively constant static vacuum measurements in observation wells) exist in soils from the previous applied vacuum. Conductance of a step pump test will indicate a significant increase in static vacuum or air velocity with increasing applied vacuum near an extraction well. However, at distance from an extraction well, a significant increase in static vacuum or air velocity will not be observed with an increase in applied vacuum. Pneumatic pump tests allow determination of radial distances from extraction wells in which air velocity is sufficient to ensure remediation.

After initial placement of extraction wells has been established based on the physics of air flow, an initial applied vacuum must be selected to ensure optimal VOC removal. In regard to mass transfer considerations, the vent rate should be increased if a significant corresponding mass flux is observed. Even though an increased vent rate may not substantially increase the propagation of vacuum with distance, air velocity will increase near the extraction well. If most contaminants are in more permeable deposits, an increase in applied vacuum will increase mass removal eventually to a point of diminishing returns or until the system is limited by diffusion.

During a field test, it is desirable to operate until mass transport limitations are realized to evaluate the long term performance of the technology. This can be achieved by isolating small selected areas of a site by the use of passive air inlet wells. When attempting to drive SVE to diffusion limited mass removal in isolated areas, applied vacuum should remain high and the distance between passive inlet and extraction wells should be minimized. Too often, SVE field tests are conducted for relatively short periods of time (e.g., 2 - 21 days) which only result in assessment of air permeability and initial mass removal. Longer field studies (e.g., 6 months - 12 months) enable better insight into mass transfer limitations which eventually govern SVE effectiveness.

SCREENED INTERVAL

The screened interval of extraction wells will play a significant role in directing air flow through contaminated soils. Minimum depths are recommended by some practitioners for SVE operation to avoid short-circuiting of air flow. However, the application of SVE need not be limited by depth to water table since horizontal vents can be used in lieu of vertically screened extraction wells to remediate soils with shallow contamination. Extraction wells generally do not circulate air effectively below their screened interval. For remediation of highly permeable soils with deep contamination, an extraction well should be discretely screened at the maximum depth of contamination or to the seasonal low water table, whichever is shallowest, to direct air flow and reduce short-circuiting. For less permeable soils, or for more continuous vertical contamination, a higher and longer screened interval may be useful. In stratified systems, such as in the presence of clay layers between more permeable deposits, more than one well may be required, each venting a distinct strata. Screening an extraction well over two strata of significantly different permeability will result in most air flow being directed only in the strata of greater permeability.

During venting, the reduced pressure in the soil will cause an upwelling of the water table (5). The change in water table elevation can be determined from the predicted radial pressure distribution. Johnson et al. (1988) indicated that upwelling can be significant under typical venting conditions. If the water table does rise, and the contaminated zone lies just above the water table, ground water can then become contaminated, the contaminated soil zone will become saturated, and overall mass removal rates will be drastically lowered. The authors suggest maintaining the ground water below the region of contamination to minimize adverse effects of ground water upwelling due to SVE system operation.

PLACEMENT OF OBSERVATION WELLS

Observation wells are essential in determining whether contaminated soils are being effectively ventilated and in the evaluation of interactions among extraction wells. The more homogeneous and isotropic the unsaturated medium, the fewer the number of vapor monitoring probes required. To adequately describe vacuum propagation during a field test, usually at least three observation well clusters are needed within the ROI of an extraction well. At least one of these clusters should be placed near an extraction well because of a logarithmic decrease in vacuum with distance. The depth and number of vapor probes within a cluster depends on the screened intervals of extraction wells and soil stratigraphy. However, vertical placement of vapor probes might logically be near the soil-water table interface, soil horizon interfaces, and near the soil surface. As previous mentioned, the use of air flow modeling can assist in optimizing the depth and placement of vapor observation wells and in the interpretation of data collected from these monitoring points.

When constructing the observation wells, metal (e.g., brass, aluminum, stainless steel) sampling lines and screens should be utilized instead of teflon or other materials which may absorb contaminants. Because of contaminant absorption, teflon may impart contaminant "memory" when sampling. Also, when constructing observation wells it is desirable to minimize vapor storage volume in the screened interval and sample transfer line. This will minimize purging volumes and ensure a representative vapor sample in the vicinity of each observation well.

Analysis of soil gas in an on-site field laboratory is preferred to provide real time data for implementation of engineering controls and process modifications. It is recommended that steel canisters, sorbent tubes, or direct GC injection be used lieu of Tedlar bags when possible because of potential VOC loss through bag leakage or diffusion within the teflon material itself. This problem may lead to erroneous analytical results and the potential of a false negative indication of soil remediation at low soil gas concentrations.

USE OF PASSIVE OR ACTIVE INJECTION WELLS WITH OR WITHOUT SURFACE SEALING

Surface covering or sealing in combination with passive or active air injection has been utilized to promote horizontal air flow or to force air through pneumatically resistant soil. Injection wells are typically placed at the perimeter of a site, while extraction wells are placed in areas of high contamination. The usefulness of surface barriers is disputable. In Crow et al. (1987), the effectiveness of passive air inlet wells with an impermeable cover was evaluated by measuring flow into the inlet wells as a fraction of flow from extraction wells at three flow rates. The air inlet wells comprised only a small fraction (9.2, 9.5 and 10.8%) of the total exhaust. The most significant impact on vacuum extraction from surface sealing may be a decrease in soil moisture content due to decreased infiltration. This would have a positive effect on air conductivity but potentially a negative effect on microbial activity and VOC sorption. The effect of surface sealing and air injection can be evaluated by conducting pneumatic pump tests with the inlet wells closed and open. Air flow into the inlet wells can be measured with a hot wire anemometer to determine the percentage of extracted air originating at the inlet wells. It is recommended that when one elects to use engineering modifications such as covers in a SVE system, that their effectiveness be demonstrated during a field test so such results may assist others in determining whether to use similar engineering modifications during SVE operation at other sites.

SUMMARY/CONCLUSIONS

While the application of soil vacuum extraction is conceptually simple, its success depends on understanding complex subsurface physical, chemical, and biological processes which provide insight into factors limiting SVE performance. Optimizing SVE performance is critical when attempting to meet stipulated soil-based clean-up levels required by regulators. The first step in evaluating SVE application is to assess contaminant volatility. Volatility is a function of a contaminant's soil-water partition coefficient and Henry's constant if present in a three-phase system, and a contaminant's vapor pressure and mole fraction in an immiscible fluid, if present in a four phase system. Volatility is greatly decreased when soils are extremely dry. As vacuum extraction proceeds, lower molecular weight organic compounds preferentially volatilize and biodegrade. Decreasing mole fractions of lighter compounds and increasing mole fractions of heavier compounds affect observed offgas concentrations. Understanding contaminant volatility is necessary when attempting to utilize offgas vapor concentrations as an indication of SVE progress.

The significance of mass transport limitations should be evaluated during SVE field tests. Long term performance of SVE will most likely be limited by diffusion from soil regions of lesser permeability which are not exposed to direct airflow. Mass transport limitations can be assessed by isolating a small area of a site and aggressively applying vacuum extraction. Simplistic methods to evaluate remediation time as described by Terra-Vac (1989) should be avoided. One of the most promising uses of vacuum extraction is in manipulating subsurface oxygen levels to enhance biodegradation. When conducting field studies, it is recommended that CO_2 and O_2 levels be monitored in vapor probes to evaluate the feasibility of VOC and semivolatile contaminant biodegradation.

Air permeability in soil is a function of a soil's intrinsic permeability and liquid content. Relative permeability of air can be predicted using relationships developed by Brooks and Corey (1964) and Van Genuchten (1980). The most effective method of measuring air permeability is by conducting pneumatic pump tests. Information gained from pneumatic pump tests can be used to determine site-specific design considerations such as the spacing of extraction wells. Measured or anticipated zones of influence are not particularly useful in spacing extraction wells. Extraction wells should be located to maximize air velocity in contaminated soils. Pneumatic pump tests with increasing applied vacuum may be useful in determining radial distances from extraction wells in which air velocity is sufficient to ensure remediation. Extraction wells generally do not circulate air effectively below their screened interval. Screened intervals should be located at or below the depth of contamination. In stratified soils, more than one well may be necessary to ventilate each strata. At least three observation well clusters are usually necessary to observe vacuum propagation within the radius of influence of an extraction well. Logical vertical placement of vapor probes might be near the soil-water table interface, soil horizon interfaces, and near the soil surface. Teflon should be avoided when constructing vapor probes and for storage of gas samples. Lastly, the effect of engineering modifications such as surface sealing should be demonstrated during a field test to assist others in determining whether to use similar modifications at other sites.

DISCLAIMER

This paper has not been sujected to Agency review and therefore does not necessarily reflect the views of the U.S. Environmental Protection Agency.

REFERENCES

(1) Baehr, A.L., and Corpacioglu, 1987. A Compositional Multiphase Model for Ground-Water Contamination by Petroleum Products. 2: Numerical Solution, Water Resources Research, Vol. 23, No. 1, pp 201-213.

(2) Crow, W.L., Andersen, E.P., and Minugh, E.M., 1985. "Subsurface Venting of Vapors Emanating from Hydrocarbon Product on Ground Water," Final Report, American Petroleum Institute, September 1985.

(3) Hinchee, R.E., 1989. Enhanced Biodegradation Through Soil Venting, Proceedings of theWorkshop on Soil Vacuum Extraction, Robert S. Kerr Environmental Research Laboratory, Ada, Oklahoma, April 27-28, 1989.

(4) Johnson, J.J. and Sterrett, R.J. 1988. Analysis of In Situ Air Stripping Data, Proceedings of the 5th National Conference on Hazardous Wastes and Hazardous Materials, HMCRI, Las Vegas, NV, April 19-21, 1988, pp. 451-455.

(5) Johnson, P.C., Kemblowski, M.W., and Colthart, J.D., 1988. Practical Screening Models for Soil Venting Applications, NWWA/API Conference on Petroleum Hydrocarbons and Organic Chemicals in Groundwater, Houston, TX, 1988.

(6) Johnson, R.L., 1989. Soil Vacuum Extraction: Laboratory and Physical Model Studies, Proceedings of the Workshop on Soil Vacuum Extraction, Robert S. Kerr Environmental Research Laboratory, Ada, Oklahoma, April 27-28, 1989.

(7) Massmann, J.W., 1989. "Applying Groundwater Flow Models in Vapor Extraction System Design," Journal of Environmental Engineering, Vol. 115, No. 1, February, 1989, pp. 129-149.

(8) Rawls, W.J., Brakensiek, D.L., and Saxton, K.E., 1982. Estimation of Soil Water Properties, Transactions of the ASAE, 1982, pp. 1316-1328.

(9) Spencer, W.F., Claith, M.M., and Farmer, W.J., 1969. Soil Sci. Am. Proc. 33, 509-511.

(10) Terra-Vac In Situ Vacuum Extraction System, Applications and Analysis Report, 1989. U.S. Environmental Protection Agency, Cincinnati, OH, EPA/540/A5-89/003.

(11) Van Genuchten, M.T., 1980. A Closed-form Equation for Predicting the Hydraulic Conductivity of Unsaturated Soils, Soil Sci. Soc. Am. J., 44:982-898.

(12) Wilson, D.J., 1989. Modeling of Soil Vapor Stipping, Proceedings of the Workshop on Soil Vacuum Extraction, Robert S. Kerr Environmental Research Laboratory, Ada, Oklahoma, April 27-28, 1989.

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Governor

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OFFICE OF RCRA
Waste Management Division
U.S. EPA, REGION V

CERTIFIED MAIL
JAN 2 3 1991

NOTICE OF DEFICIENCY

January 8, 1991

Mr. Ron Roch
Vernitron Piezoelectric Division
232 Forbes Road
Bedford, Ohio 44146

RE: CLOSURE PLAN

Vernitron Piezoelectric Division
OHD 052 324 290

Dear Mr. Roch:

On December 19, 1989, Ohio EPA received from Vernitron Piezoelectric Division a closure plan for a drum storage area located at 232 Forbes Road, Bedford, Ohio.

This closure plan was submitted pursuant to Rule 3745-66-12 of the Ohio Administrative Code (OAC) in order to demonstrate that the Vernitron Piezoelectric Division proposal for closure complies with the requirements of OAC Rules 3745-66-11 and 3745-66-12.

The public was given the opportunity to submit written comments regarding the closure plan in accordance with OAC Rule 3745-66-12. The public comment period extended from June 11, 1990 through July 17, 1990. No public comments were received by Ohio EPA.

Pursuant to OAC 3745-66-12(D)(4), I am providing you with a statement of deficiencies in the plan, outlined in Attachment A.

Please take notice that OAC Rule 3745-66-12 requires that a modified closure plan addressing the deficiencies enumerated in Attachment A be submitted to the Director of the Ohio EPA for approval within thirty (30) days of the

Mr. Roch
Page Two

receipt of this letter. The modified closure plan should be submitted to: Ohio Environmental Protection Agency, Division of Solid and Hazardous Waste Management, Attn: Thomas Crepeau, Manager, Data Management Section, P.O. Box 1049, Columbus, Ohio 43266-0149. A copy should also be sent to: Greg Taylor, Ohio EPA, Northeast District Office, 2110 East Aurora Road, Twinsburg, Ohio 44087.

Upon review of the resubmitted plan, I will prepare and issue either a draft or a final action approving or modifying such plan. If you wish to arrange a meeting to discuss your responses to this Notice of Deficiency, please contact Paul Vandermeer, Ohio EPA, DSHWM, Central Office (614) 644-2956 or Greg Taylor at (216) 425-9171.

Sincerely,

Richard L. Shank, Ph.D.
Director

RLS/PV/pas

cc: Tom Crepeau, DSHWM, Central File, Ohio EPA 644-2329
Lisa Pierard, USEPA, Region V
Joel Morbito, USEPA, Region V
Greg Taylor, NEDO, Ohio EPA
Paul Vandermeer, CO, Ohio EPA

OhioEPA

State of Ohio Environmental Protection Agency

P.O. Box 1049, 1800 WaterMark Dr.
Columbus, Ohio 43266-0149

Richard F. Celeste
Governor

CERTIFIED MAIL

NOTICE OF DEFICIENCY

January 8, 1991

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File in Part A File

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Joel Morbito, USEPA, Region V
Greg Taylor, NEDO, Ohio EPA
Paul Vandermeer, CO, Ohio EPA

ATTACHMENT A

1. Vernitron Piezoelectric (VP) shall revise the closure plan to include clean closure of the indoor drum storage area. Past inspections (June 26, June 28, and July 5, 1989) revealed the need for decontamination activities, and the subsequent Ohio EPA inspection letter (August 15, 1989) outlined this requirement.

2. Examination of this report and others (October 1988 and March 1989) warrant the requirement that additional soil samples be collected to determine the extent of contamination in the soil area where the asphalt was removed to further characterize the horizontal and vertical extent of lead contamination. Currently, there are only 3 sample locations in this area, and there are indications of substantial contamination from lead. Additionally, VP shall delete the statement that the extent of lead contamination has been determined. This is not apparent from examination of the sampling results in Figure 2. Additional samples shall be collected from the northwestern, northeastern, eastern and southwestern sections and analyzed for total lead.

3. VP shall revise the closure plan to delete the statement that the extent of volatile organic chemical contamination has been determined. Additional sampling shall be implemented to define the extent of contamination from volatile constituents completely. The northern area (samples 63-65), southeastern area (samples 49, 70-72) and the asphalt area (samples 61, 73) still show constituents present and need to be further characterized to define the complete extent of contamination. VP shall clearly state in the text the specific volatile constituents of concern (i.e., tetrachloroethene, trans-1,2,dichloroethene, trichloroethene, toluene, etc.)

4. The results of the preliminary ground water investigation showed VOC's in all three ground water monitoring wells. The results indicate a significant degree of contamination of the uppermost aquifer. VP shall prepare and submit a

comprehensive ground water monitoring plan which will determine the full extent of contamination and the rate at which it is moving. The ground water monitoring plan shall include the following items at a minimum:

* A description of the regional geology and hydrologic characteristics of the area around the facility including local and regional ground water flow systems;

* A description of the site hydrogeology and aquifer system including methods for identifying zones of saturation and perched water zones, identification and characterization of ground water recharge and discharge areas, and aquifer type (i.e., location, depth, thickness, lithologic characteristics, horizontal extent, water bearing zones above the first confining layer which may serve as a pathway for contaminant migration);

* Justification for the location of the screened interval(s) for the ground water monitoring wells with reference to the requirements of monitoring the uppermost aquifer;

* A narrative explaining monitor well construction and installation techniques including a description of drilling methods, length and placement of screened intervals, the diameter and depth of wells, the type of well screening and casing material, well intake design with screen slot size, filter pack material and methods of placement, methods for sealing the well at the surface, and procedures used to develop the wells and the criteria to determine when development has been completed; and

* An explanation of ground water sampling and analysis including procedures for measuring static water level, flow system (horizontal and vertical components) interpretation including seasonal fluctuations, well sampling procedures including disposal of purge water,

sample withdrawal techniques, sample handling and preservation including field filtration of samples, procedures for decontamination of sampling equipment between sampling events (need specific procedures and materials to accomplish proper decontamination), protocol for measuring ground water elevations at each sampling event, constituents (parameters) to be evaluated and the laboratory procedures and detection limits involved, and chain-of-custody and quality assurance/quality control information.

5. In the November 1989 report, one ground water sample result indicated low concentrations of lead in the ground water. Even though this concentration is below the MCL, Ohio EPA cannot agree with VP that sufficient evidence exists for the conclusion that ground water remediation for lead is unnecessary. Additional sampling of ground water for lead is therefore required.

6. There is no evidence presented in the November 1989 report to substantiate the conclusion that VOC's are unlikely to move through the Orangeville Shale to the Berea Sandstone aquifer. VP shall include procedures in the ground water investigation to determine whether or not the Orangeville Shale is a confining layer preventing migration of contaminants from the upper aquifer.

7. VP shall revise the closure plan to include a specific approach for collecting confirmation samples after remedial activities are completed. The proposal to take samples every 50 feet is not acceptable. The following formula is useful to calculate the appropriate grid interval for sampling of the area:

$$\text{Grid Interval} = \frac{(\text{Area} / \pi)^{1/2}}{2}$$

VP shall use analytical methods from USEPA Publication SW-846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," Third Edition.

8. VP shall revise the closure plan clean standards as follows to conform to Ohio EPA clean standards:

A. For organic contaminants, soils shall be considered clean when concentrations of these constituents fall below the SW-846 analytical detection limit. The 1 mg/kg standard as proposed in the closure plan is unacceptable.

B. For naturally occurring elements (e.g., lead), the clean standard shall be the background mean plus two positive standard dirations. [To establish background, VP shall select 16 background sampling points in consultation with Ohio EPA, Northeast District Office. These points shall be selected to represent an area not directly affected by any waste activities. All points and sampling data from these points shall be reviewed and approved by Ohio EPA. Analytical data from these points shall be submitted to Ohio EPA, Northeast District Office, within ten days of receipt by VP. Ohio EPA may reject any sampling point.] Therefore, the clean standard for lead is unacceptable also.

Alternatively, VP may perform a risk assessment and propose a risk-based clean standard for the constituents of concern (see Attachment B for further information on risk assessment).

9. VP shall revise the closure plan to include a site health and safety plan to be implemented during closure activities. The plan shall address items such as personal protective equipment to be used by personnel performing closure activities, protection of employees and visitors not involved in the closure process, decontamination of personnel performing closure activities, protection of employees and visitors not involved in the closure process, design of the decontamination area showing how decontamination residues will be contained, and emergency contingency plans including the names and telephone numbers of emergency authorities.

10. VP shall revise the closure plan to indicate that the Toxicity Characteristic Leaching Procedure (TCLP) will be required to determine whether material is hazardous waste rather than Extraction Procedure Toxicity. This took effect on September 25, 1990 and shall be incorporated into the closure plan.

11. VP shall revise the closure plan to include a topographic or county map depicting the surrounding area and the location of the facility. Additionally, VP shall include a brief description of the facility, the types of operations that occur there, and the types and volumes of waste stored in the two drum storage areas.

12. VP shall revise the closure plan to include an itemized closure cost estimate, a schedule of closure activities (including sampling, excavation, vapor extraction testing, and the times when the qualified, independent, registered professional engineer will be present to observe closure activities) and a specific time when the results from the vapor extraction pilot study will be available for review and a determination of feasibility.

13. The vapor extraction system (VES) proposed by VP is not acceptable in its present form. The technical information presented is not sufficient to evaluate the proposed pilot system. Please refer to the attached paper regarding field testing procedures for this type of system (Attachment C).

ATTACHMENT B

Ohio EPA

State of Ohio Environmental Protection Agency

P.O. Box 1049, 1800 WaterMark Dr.
Columbus, Ohio 43266-0149

Richard F. Celeste
Governor

Inter-Office Communication

To: Distribution May 11, 1990

From: Anthony Sasson through Ed Kitchen, TAS, DSHWM, Ohio EPA

Subject: Revised Risk Assessment References for Hazardous Waste Closures

On May 10, 1989, I distributed a list of Risk Assessment References that may be useful in the preparation and review of closure plans or other RCRA items. The following is an update of this list; please disregard the old (3/2/89 and 5/10/89) lists. In addition, this IOC discusses soil lead contamination risk.

The TAS is currently preparing an update of the Division of Solid and Hazardous Waste Management's (DSHWM) Closure Plan Review Guidance of February 8, 1988. In the interim, please use the following information as an update for risk assessment information.

For the D.O. DSHWM Group Leaders, I have also attached a copy of one of the listed documents, U.S. EPA's "Superfund Exposure Assessment Manual" EPA/540/1-88/001, that should be useful in preparation and review of risk assessments. It should be used in conjunction with other references discussed on page 2 of this IOC.

****

Ohio EPA, DSHWM, Risk Assessment Closure References and Interim Guidance

Ohio EPA adopted the equivalent of U.S. EPA's March 19, 1987, regulations on December 8, 1988, (see OAC 3745-67-28) clarifying that risk assessment may be an option. It is Ohio EPA, DSHWM, policy to consider risk assessment as a possible third option for closure for all types of units (See Ohio EPA Inter-Office Communication of November 19, 1987, from Ed

Kitchen, Manager, TAS, DSHWM). Ohio EPA wil expect complete, site-specific demonstrations of p ection of hur health and the environment in such closure ans.

An additional closure option, "hybrid clos e," was propos by U.S. EPA on March 19, 1987 (52 FR 8712 No further action has been taken on this option and not expected the near future.

The owner/operator has the option to propose site-spec c, health-based cleanup targets. Site-specific cleanup targets proposals must document that the contaminants left in the soil will not adversely impact any environmental media (ground water, surface water, or atmosphere), and that direct contact through dermal exposure, inhalation or ingestion will not result in a threat to human health or the environment (e.g., for carcinogens, the excess cancer rate must not exceed 1 x 10-6 for the entire suite of contaminants, not each individual constituent, to be left in place; for non-carcinogens, the hazard index must not exceed one (1)). We have been told that U.S. EPA is developing a guidance document for clean closure. Until such a document becomes available and Ohio EPA, DSHWM, acknowledges it as acceptable to the Agency, closure plan preparers and reviewers should refer to this memorandum, 52 FR 8704 (March 19, 1987)(U.S. EPA 1987b), and the draft U.S. EPA "Surface Impoundment Clean Closure Guidance Manual" (October 12, 1987) (U.S. EPA 1987c) for guidance. The latter may contain points that have been updated by other guidance or policy since its release, and therefore its assumptions should not be used without checking with the Technical Assistance Section of DSHWM, Ohio EPA. Also, "RAGS" (U.S. EPA, 1989h), "SEAM" (U.S. EPA 1988a) and the "Exposure Factors Handbook" (U.S. EPA 1989d) are the references that should be used for toxicological assumptions and exposure assessments. For any points which require professional judgement, such as exposure assessments, preparers and reviewers should contact the Technical Assistance Section of DSHWM, Ohio EPA at 614/644-2956.

Please be aware that the calculated risks are cu lative for all routes of exposure and hazardous constituent

Preliminary clean-up targets published in the dra Surface Impoundment Clean Closure Guidance Manual (U.S. EF 1987c, below) are not acceptable without supporting calcu tions and risk analysis. Also, due its lack of completeness Ohio EPA does not consider the RFI Guidance (U.S. EPA 1989e) to be and acceptable guidance document for RCRA closures, but it may provide some relevant basic guidance. Toxicity information for hazardous constituents can be obtained through U.S. EPA's IRIS (see description below) or U.S. EPA's Office of Solid Waste, Characterization and Assessment Branch, in Washington, DC, (202) 382-4761 .

Because a risk assessment demonstration is considered a clean closure, no subsequent post-closure monitoring will be required and the property owner will not be subject to RCRA imposed restrictions on the use of the property. Therefore, risk assessment demonstrations based on site controls (e.g., fencing, paving, etc.), self-imposed deed restrictions, and fate and transport models are unacceptable.

Reference List

References which may be helpful in developing a risk assessment proposal are as follows:

U.S. EPA. 1985. Toxicology Handbook: Principles Related to Hazardous Waste Site Investigations. Program #1393, Subcontract #TES EMI-LS, Contract #68-01-7037, PRC Work Assignment #135.

U.S. EPA. 1986a. Part II. Guidelines for Carcinogen Risk Assessment. Federal Register Vol. 51, No. 185, September 24, 1986. pp. 33992-34003.

U.S. EPA. 1986b. Part IV. Guidelines for the Health Risk Assessment. Federal Register Vol. 51, No. 185, September 24, 1986. pp. 34042-34054.

U.S. EPA. 1986c. Superfund Public Health Evaluation Manual. EPA/540/1-86/060. OSWER Directive 9285.4-1. U.S. EPA, Office of Emergency and Remedial Response. Washington, D.C.

U.S. EPA. 1987a. The Risk Assessment Guidelines of 1986. EPA/600/8/87/045. U.S. EPA, Office of Health and Environmental Assessment, Washington, D.C. (Includes U.S. EPA 1986a and 1986b above)

U.S. EPA. 1987b. 40 CFR Part 265, Interim Status for Owners and Operators of Hazardous Waste Treatment, Storage, and

Disposal Facilities, Final Rule. Federal Register Vol. 52, No. 53, March 19, 1987, pp. 8704-8709.

U.S. EPA. 1987c. Surface Impoundment Clean Closure Guidance Manual (Draft). EPA/530-SW-87-022. OSWER Policy Directive 9476.00-8.c. U.S. EPA, Office of Solid Waste, Washington, D.C.

U.S. EPA. 1988a. Superfund Exposure Assessment Manual. EPA/540/1-88/001. OSWER Directive 9285.5-1. U.S. EPA, Office of Remedial Response. Washington, D.C.

U.S. EPA. 1988b. Risk Assessment Guidelines and Information Directory. Government Institutes, Inc., Rockville, MD. (Includes U.S. EPA 1986a and 1986b above)

U.S. EPA. 1989a. Ecological Assessments of Hazardous Waste Sites: A Field and Laboratory Reference Document. EPA/600/3-89/013. U.S. EPA, Office of Research and Development, Corvallis Environmental Research Laboratory, Corvallis,
Oregon.

U.S. EPA. 1989b. Ecological Risk Assessment Methods: A Review and Evaluation of Past Practices in the Superfund and RCRA Programs. EPA-230-03-89-044. U.S. EPA, Office of Policy Analysis/Office of Policy, Planning and Evaluation, Washington, D.C.

U.S. EPA. 1989c. Ecological Risk Management in the Superfund and RCRA Programs. EPA-230-03-89-045. U.S. EPA, Office of Policy Analysis/Office of Policy, Planning and Evaluation, Washington, D.C.

U.S. EPA. 1989d. Exposure Factors Handbook. EPA/600/8-89/043. U.S. EPA, Office of Health and Environmental Assessment, Washington, D.C.

U.S. EPA. 1989e. Interim Final, RCRA Facility Investigation (RFI) Guidance, Volume I of IV, Development of an RFI Work Plan and General Considerations for RCRA Facility Investigations. EPA/530-89-031. U.S. EPA, Office of Solid Waste, Washington, D.C. (See Section 8 - Health and Environmental Assessment)

U.S. EPA. 1989f. The Nature and Extent of Ecological Risks at Superfund Sites and RCRA Facilities. EPA-230-03-89-043. U.S. EPA, Office of Policy Analysis/Office of Policy, Planning and Evaluation, Washington, D.C.

U.S. EPA. 1989g. Risk Assessment Guidance for Superfund. Volume II. Environmental Evaluation Manual. Interim Final. EPA/540/1-89/001. U.S. EPA, Office of Emergency and Remedial Response, Washington, D.C.

U.S. EPA. 1989h. Risk Assessment Guidance for Superfund. Volume I. Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1-89/002. U.S. EPA, Office of Emergency and Remedial Response, Washington, D.C.

U.S. EPA. 1989i. Summary of Ecological Risks, Assessment Methods, and Risk Management Decisions in Superfund and RCRA. EPA-230-03-89-046. U.S. EPA, Office of Policy Analysis/Office of Policy, Planning and Evaluation. Washington, D.C.

In many cases, guidance found in CERCLA guidance may appear to conflict with RCRA guidance or Ohio EPA, DSHWM, guidance. In all cases, DSHWM guidance and U.S. EPA (1987b), above, should be used for the RCRA program. All risk assessment preparers and reviewers are encouraged to scrutinize U.S. EPA (1987b) and <u>carefully follow the detailed assumptions for risk assessment in this reference.</u> Ohio EPA follows the guidance in this reference.

To obtain the latest descriptive and quantitative information on hazardous constituents and risk assessment, risk assessment closure plan preparers and reviewers should refer to the Integrated Risk Information System (IRIS), which is prepared and maintained by U.S. EPA as an electronic data base containing health risk and regulatory information on specific hazardous constituents. Ohio EPA considers IRIS data to be acceptable for closure plan risk assessments.

IRIS is accessible by U.S. EPA, Ohio EPA and local government staff, and is available to libraries, private citizens, and other organizations by means of Dialcom, Inc.'s Electronic Mail telecommunication system and the Computer Information System (CIS). For information on access to IRIS, contact U.S. EPA's Office of Health and Environmental Assessment in Washington, D.C.

Soil Lead Contamination

Surficial soil contaminated with lead presents a unique health risk to children because of the possible ingestion of contaminated soil through their normal exploratory behavior, coupled in some instances with pica, and because of the cumulative nature of lead poisoning.

Currently, there is no verified Reference Dose (RfD) or Risk Specific Dose (RSD) for lead. The Carcinogen Assessment Group (CAG) of U.S. EPA's Office of Research and Development is evaluating lead as a potential human carcinogen via the oral route of exposure and is currently working on estimating a Carcinogenic Slope Factor (CSF) for lead based on current toxicity studies. The U.S. EPA is also attempting to develop a RfD for lead based on new toxicologic data on the non-carcinogenic, neuro-behavorial effects of lead exposure. It is not likely, however, that either the RfD or the RSD will be developed and approved soon (U.S. EPA 1989e).

A U.S. EPA, OSWER, Superfund directive (#9355.4-02) of September 7, 1989, from Henry Longest and Bruce Diamond of U.S. EPA set forth interim soil cleanup levels for lead at Superfund sites. It is Ohio EPA, DSHWM's policy at this time that the levels proposed in U.S. EPA's directive are not applicable to Ohio hazardous waste closures. We expect to establish a lower cleanup level. In the interim, DSHWM policy should be that natural background (Mean plus two standard deviations) or Ohio Farm Soils values (Logan, T.J. and R.H. Miller. 1983. Background Levels of Heavy Metals in Ohio Farm Soils. Research Circular 275, Ohio State University, Ohio Agricultural Research and Development Center, Wooster, Ohio. 15 pp). Again, contact the Technical Assistance Section, DSHWM, for current policy on this issue.

Please contact me at 614/644-2956 if there are questions.

Distribution: Linda Welch, Chief, DSHWM
D.O. DSHWM Unit Supervisors
Dave Sholtis, Asst. Chief, DSHWM
Randy Meyer/Paul Vandermeer, DSHWM
DSHWM Unit Supervisors
Kathy Davidson/Hallie Serazin, DERR
D.O. DSHWM Group Leaders w/SEAM attachment
Barb Bonds, Asst. Chief, DSHWM

EK/as pw3 risklist

ATTACHMENT C

RECEIVED
OHIO EPA

MAY 29 1990

DIV. of SOLID & HAZ. WASTE MGT.

CONDUCTING FIELD TESTS FOR EVALUATION OF SOIL VACUUM EXTRACTION APPLICATION

Dominic C. DiGiulio and Jong Soo Cho, Ph.D.
U.S. Environmental Protection Agency Robert S. Kerr Environmental Research Laboratory
Superfund Technology Support Center P.O. Box 1198 Ada, Oklahoma 74820

R. Ryan Dupont, Ph.D. and Marian W. Kemblowski, Ph.D.
Department of Civil and Environmental Engineering
Utah Water Research Laboratory Utah State University

ABSTRACT

The application of soil vacuum extraction (SVE) is conceptually simple. Its success however, depends on an understanding of complex subsurface physical, chemical, and biological processes which unfortunately are seldom appreciated. This is evident in the execution of many field or pilot scale tests which often do not generate data applicable at other sites or which provide insight into the ability of SVE to remediate soils to stipulated soil based performance standards within a reasonable period of time. This paper provides recommendations in designing field tests to evaluate the applicability and limitations of soil vacuum extraction under various soil-contaminant conditions.

INTRODUCTION

The ability of soil vacuum extraction (SVE) to inexpensively remove large amounts of VOCs from contaminated soils has been demonstrated repeatedly in published case studies. However, the ability and time required using SVE to remediate soils to low contaminant levels often required by state and federal regulators has not been adequately investigated. Most field studies verify the ability of an SVE system to circulate air in the subsurface and remove, at least initially, a large mass of VOCs. They do not generally provide insight into mass transport limitations which eventually limit SVE performance, nor do field studies generally evaluate methods such as enhanced biodegradation which may optimize overall contaminant removal. Discussion is presented to aid in conducting field tests which better assess SVE limitations and methods to optimize SVE application.

DETERMINING CONTAMINANT VOLATILITY

The first step in evaluating the feasibility of SVE application at a hazardous waste site is to assess contaminant volatility. If concentrations of VOCs are relatively low and the magnitude of anthropogenic organic carbon (e.g., waste oil) present in the soil is negligible, VOCs can be assumed to exist in a three-phase system (i.e., air, water, and soil), as illustrated in Figure 1. If soils are sufficiently moist, relative volatility in a three-phase system can be estimated using equation (1) which incorporates the effects of air-water partitioning (Henry's constant) and sorption (soil-water partition coefficient).

$$C_g/C_t = 1/((\rho_g K_{oc} f_{oc}/K_h) + \theta/K_h + a)) \quad (1)$$

where:

C_g/C_t = Relative Vapor Concentration ($mg/cm^3_{air}/mg/cm^3_{soil}$)
ρ_g = Bulk Density (g/cm^3)
K_{oc} = Organic Carbon-Water Partition Coefficient (cm^3/g)
f_{oc} = Fraction of organic carbon content (g/g)
K_h = Henry's Constant ($mg/cm^3_{air}/mg/cm^3_{water}$)
θ = Volumetric Moisture Content (cm^3/cm^3)
a = Volumetric Air Content (cm^3/cm^3)

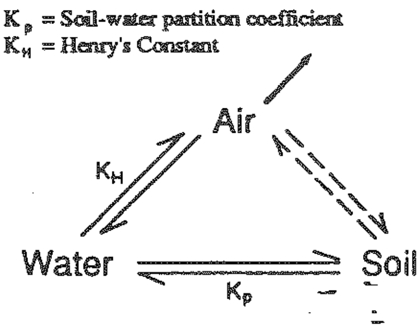

Figure 1. Three phase system.

Caution must be exercised when using this approach since this relationship was based on the assumption that soil organic carbon content is greater than 0.1% and the organic carbon is of natural humic origin. The former assumption is frequently invalid in soils below the root zone, while the latter assumption may often be invalid at hazardous waste sites in which organic carbon is of anthropogenic origin.

This approach would also not be valid when soils are extremely dry. Soil moisture may decrease as air is circulated through soil since water has a vapor pressure of 10 mm Hg at typical soil temperatures. As illustrated in Figure 2, under low soil moisture conditions, VOC vapors adsorb directly on soil surfaces where fewer water molecules are competing for adsorption sites. This increases the magnitude of sorption greatly, thus drastically reducing volatilization (9). This effect is be reversible however when soil moisture is increased. The moisture content at which a decrease in vapor density becomes apparent is often termed the critical moisture content and is generally defined as being equivalent to a monolayer of water molecules coating the soil particles (9).

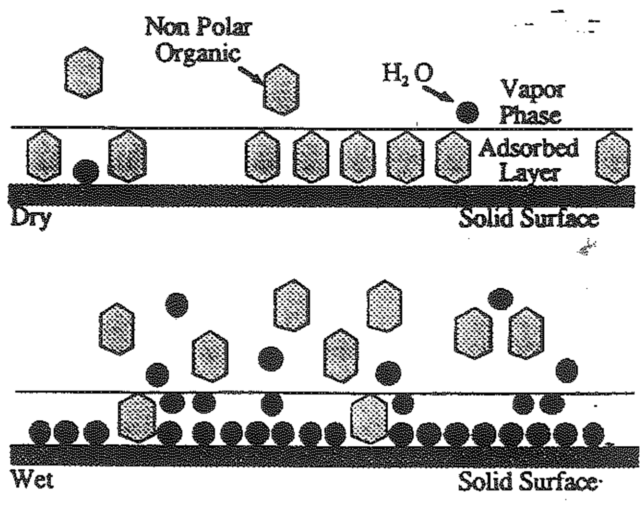

Figure 2. Voc adsorption with two moisture regimes.

The effect of soil moisture content on vapor sorption is rarely investigated at vacuum extraction sites, thus its importance is difficult to assess. Johnson and Sterrett (1988) noted that offgas dichloropropane concentrations were statistically correlated with ambient air moisture during SVE operation in Benson, Arizona. While direct sorption of vapors on soil surfaces would appear more likely in arid areas, it could conceivably be important in temperate areas during warm dry summers. The effect of moisture content on contaminant volatility can be assessed by monitoring VOC concentrations in vapor observation wells with concurrent in-situ measurement of moisture content or matric potential (e.g., neutron probes, tensiometers) in adjacent soils. If a site is to be covered in an attempt to induce greater lateral subsurface air flow, the effect of the cover on contaminant volatility through elimination of infiltration and subsequent decrease in soil moisture content should be monitored over time, especially in arid areas.

If soils are visibly contaminated or the presence of immiscible fluids is suspected in soils based on high contaminant, total organic carbon, or total petroleum hydrocarbon analysis, contaminants are likely present in a four phase system as illustrated in Figure 3. Under these circumstances, most of the VOC mass will be associated with the immiscible fluid and assuming that the fluid acts as an ideal solution, volatilization will be governed by Raoult's Law.

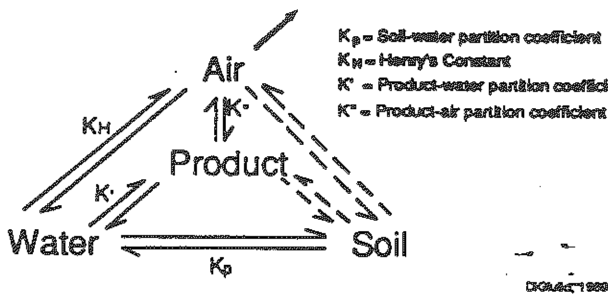

Figure 3. Four phase system.

$$P_a = X_a P^o_a \qquad (2)$$

where:

P_a = vapor pressure of component over solution (mm Hg)
X_a = mole fraction of component in solution
P^o_a = vapor pressure of pure component (mm Hg)

In a four-phase system, contaminant volatility will be governed by the VOC's vapor pressure and mole fraction within the immiscible fluid. The vapor pressure of many compounds increases substantially with an increase in temperature while solubility in a solvent phase is much less affected by temperature. This suggests that soil temperature should be taken into account when evaluating VOC recovery for contaminants located near the soil surface (seasonal variations in soil temperature quickly dampen with depth). For instance, if conducting a field test to evaluate potential remediation of shallow soil contamination in the winter, one should realize that VOC recovery could be substantially higher during summer months, and low recovery should not necessarily be viewed as SVE system failure.

As vacuum extraction proceeds, lower molecular weight organic compounds will preferentially volatilize and degrade. This process is commonly described as weathering and has been examined both theoretically (1) and in laboratory experiments (6). In the latter, samples of gasoline were sparged with air and the concentration and composition of vapors were monitored. Figure 4 illustrates the normalized concentrations of a variety of gasoline constituents as a function of the fractional volume of gasoline remaining in the study. The efficiency of vapor extraction decreased to less than 1% of its initial value even though approximately 40% of the gasoline remained. The normalized concentration of less volatile compounds (i.e., toluene) increased as shown in Figure 4, due to an increase in their mole fractions in residual gasoline as the more-volatile components were removed. Theoretical and experimental work on product weathering indicate the need to monitor specific VOCs of concern in extraction and observation wells when attempting to evaluate the rate of removal of specific compounds since their removal cannot be inferred directly from total VOC or total hydrocarbon measurements.

When assessing contaminant volatility then, one should determine whether volatility is controlled by a compound's Henry's Law Constant and soil-water partition coefficient or by its vapor pressure and mole fraction in an immiscible fluid (i.e., Raoult's Law). Soils contaminated by bulk spillage of compound classes such as ketones, ethers, and alcohols can be remediated using SVE, contrary to what one would expect using Henry's Constants or C_g/C_l values, because of their high vapor pressures and likely presence in soil as a separate phase. Timely remediation is essential for these types of compounds, however, because of their high solubility and unretarded transport through soil.

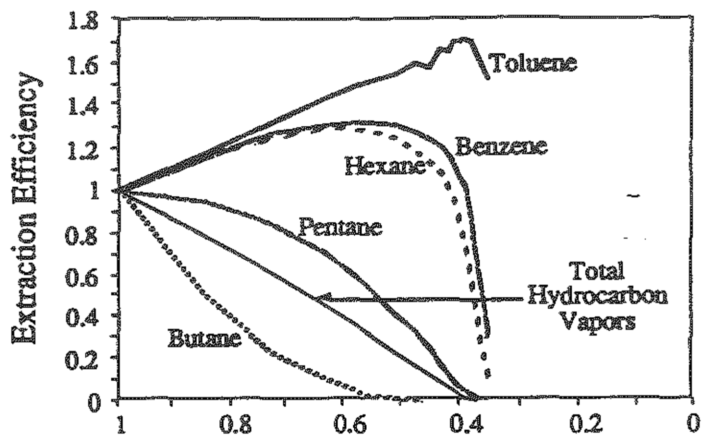

Figure 4. Fraction gasoline remaining vs. extraction efficiency.

EVALUATING AIR FLOW

Air permeability (k_a) in soil is a function of a soil's intrinsic permeability (k_i) and liquid content. At hazardous waste sites, liquid present in soil pores is often a combination of soil water and immiscible fluids. Air permeability (k_a) can be estimated by multiplying a soil is intrinsic permeability (k_i) (cm^2)by the relative permeability (k_r).

$$k_a = k_i \; k_r \quad (3)$$

k_r is a dimensionless ratio varying from one to zero describing the variation in air permeability as a function of air saturation. Equations developed by Brooks and Corey (1964) and Van Genuchten (1980) are useful in estimating air permeability as a function of air saturation or liquid content. Brooks and Corey's equation to estimate relative permeability of a non-wetting fluid (i.e. air) is given by:

$$k_r = (1 - S_e)^2 \; (1 - S_e^{2+\lambda/\lambda}) \quad (4)$$

where:

$S = \theta/\varepsilon$,
$S_e = (S - S_r)/(1-S_r) \quad (5)$
S = degree of saturation of wetting fluid
θ = volumetric moisture content
ε = total porosity
S_r = residual saturation
S_e = effective saturation
λ = pore size distribution parameter

The pore size distribution parameter and residual saturation can be estimated using soil-water characteristic curves which relate matric potential to volumetric water content. When initially developing an estimate of relative permeability for a given soil texture and liquid content, values for ε, S_r, S_e, and λ can be obtained from the literature. Rawls et al. (1982) summarized geometric and arithmetic means for Brook and Corey parameters for various USDA soil textural classes. Figure 5 illustrates relative permeability as a function of volumetric moisture content for clayey soils assuming $\varepsilon = 0.475$, $S_r = 0.090$, and $\lambda = 0.131$.

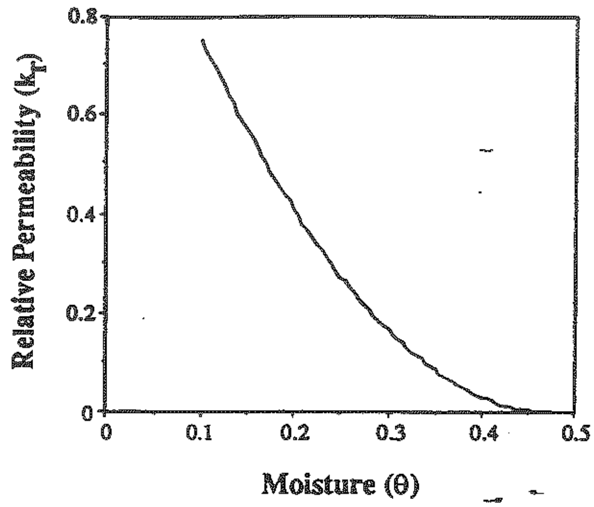

Figure 5. Moisture vs. relative permeability of clay.

Claims have been made that remediation of clayey soils is possible using vacuum extraction (10). Effective air circulation in clayey soil, though at least in primary porosity, would appear unlikely. It seems more likely that airflow in clayey soil is primary through secondary porosity. Generally, soils with high intrinsic permeabilities are more likely to be vented effectively due both to the rapidity and uniformity of air flow. In less permeable media, such as glacial till and clayey soils, secondary permeability or porosity (i.e. fractures) will dominate air flow. This will result in relatively rapid removal of VOCs present in preferential flow areas with much slower removal in areas of lower permeability.

The most effective method of measuring air permeability is by conducting a field pneumatic pump test. Using permeameters or other laboratory measurements may provide deceptive results as laboratory measurement of air flow in clay may indicate little or no flow and lead one to believe that vacuum extraction of clayey soils is infeasible because no macropore flow is observed. Information gained from pneumatic pump tests is vital in determining site-specific design considerations (e.g., spacing of extraction wells). Selecting the placement and screened intervals of extraction and observation wells and applied vacuum rates during a pump test is often based on prior information obtained from other sites, intuition, and trial and error. While it is acknowledged that this approach is often necessary, the proper use of appropriate mathematical models may aid, at least initially, in SVE field test design. The similarity of fluid flow processes of air and water in porous medium suggests the use of ground water flow models. Three-dimensional ground water flow models may be preferred over two-dimensional models when air flow in soil has a substantial vertical velocity component. When considering the use of ground water models in estimating air flow, the user should be aware that the differential equations governing pressure induced flow of gas in soil are nonlinear because of gas density dependency on pressure, while linear differential equations are typically utilized in ground water flow models. This does not introduce significant errors into flow and transport estimates however, until pressure differential exceeds 0.5 atmospheres (7), a much higher vacuum than normally required for flow and vacuum propagation in unconsolidated medium. However, even in soils in which vacuum is applied at greater than 0.5 atm, static transient vacuum measurements at short distances from the extraction well will be well below 0.5 atm.

EVALUATING MASS TRANSFER LIMITATIONS AND REMEDIATION TIME

The effects of mass transport limitations are usually manifested by a substantial drop in soil vapor contaminant concentrations as illustrated in Figure 6 or by an asymptotic increase in total mass removal with operation time. Typically, when venting is terminated, an increase in soil gas concentration is observed over time. Slow mass transfer with respect to advective air flow is most likely caused by diffusive release from differences in permeability in the column due to soil stratigraphic characteristics, as illustrated in Figure 7 or diffusive release from porous aggregate structures or lenses of lesser permeability as illustrated in Figure 8. The time required for the remediation of heterogeneous and fractured soils depends directly on the proportion of contaminated material exposed to bulk airflow. It would be expected that the long-term performance of SVE will be limited to a large degree by gaseous and liquid diffusion from soil regions not exposed to direct airflow. Since effective gaseous diffusion is approximately 10,000 times faster than liquid diffusion, remediation of clayey soils may be enhanced by decreasing moisture content to maximize gaseous diffusion.

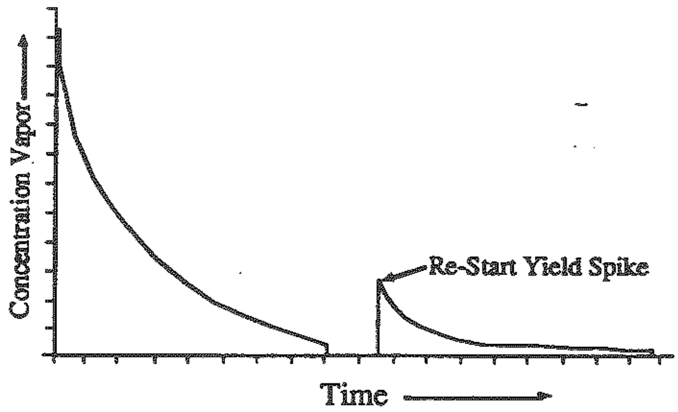

Figure 6. Concentration vs. time profile.

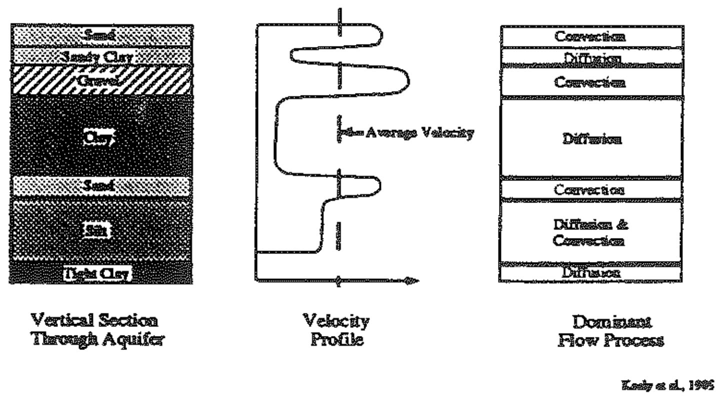

Figure 7. Effect of geologic stratification on tailing.

Regardless of possible causes, the significance of mass transport limitations should be evaluated during SVE field tests. This can be achieved by isolating a small area of a site and aggressively applying vacuum extraction until mass transport limitations (i.e., Figure 6) are realized. Isolation can be achieved by surrounding extraction wells with passive inlet wells as shown in Figure 9 to short-circuit vacuum propagation. Quantifying the effects of mass transport limitations on remediation time might

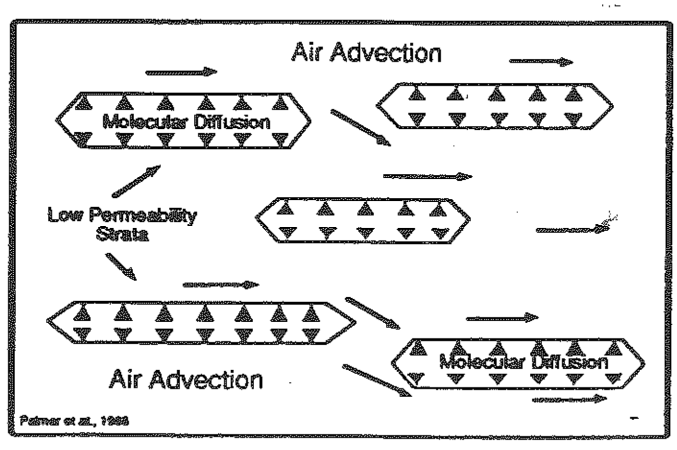

Figure 8. Diffusion release of contaminants.

then be attempted by utilizing models incorporating mass transfer rate coefficients. However, using models to estimate remediation time is anything but straightforward.

Some practitioners (10) have attempted to estimate the required remediation time by extrapolating observed extraction well offgas concentrations to a desired soil level. This is accomplished by using the contaminant's Henry's Law Constant and soil-water partition coefficient to calculate a soil-gas concentration in equilibrium with a desired final total soil concentration. As shown in Figure 10, the remediation time required to meet an equivalent soil-gas concentration is estimated by extrapolating observed extraction well offgas concentrations to the soil-gas equilibrium valve at some point in time. While observation of extraction well offgas concentrations may provide an overall indication of SVE operation, the use offgas concentrations to estimate remediation time appears questionable because:

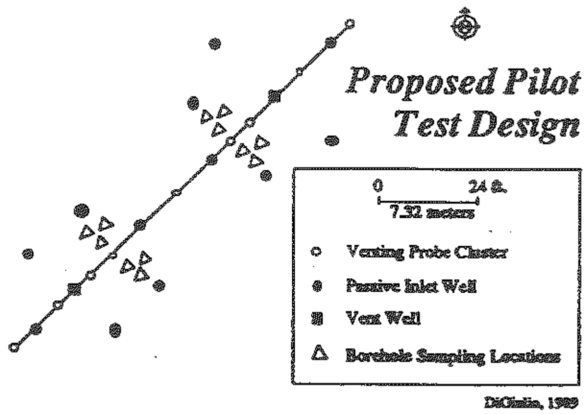

Figure 9. Proposed pilot test flight.

1. it is assumed that contaminant volatility is controlled by Henry's constant and a soil-water partition coefficient, the limitations of which were previously discussed;

2. the method does not account for air phase VOC re-equilibration caused by mass transport limitations typically observed in extraction and observation wells at cessation of vacuum application, thus providing a false indication of remediation; and

3. this procedure utilizes averaged gaseous concentration levels from actively operating extraction wells drawing air from large volumes of soil. Thus gas levels represent integrated volumes rather than discrete areas as often required by regulators.

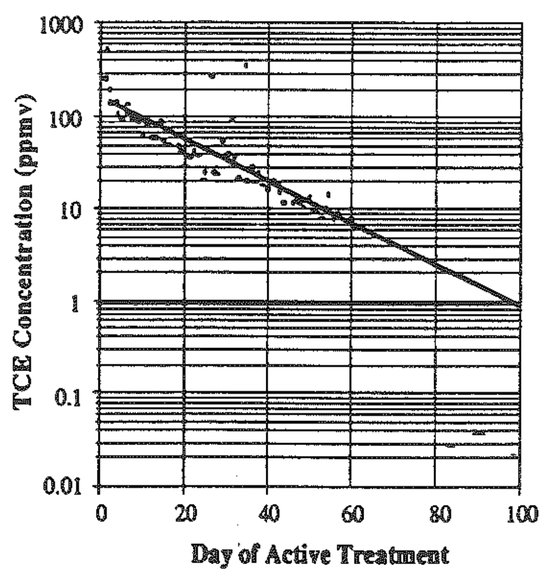

Figure 10. Wellhead TCE concentration vs. time.

The discrepancy frequently observed between mass removal predicted from equilibrium conditions using Henry's Law constants and that observed from laboratory column and field studies is sometimes reconciled by the use of "effective or lumped" soil-air partition coefficients. These parameters are determined from laboratory column tests and are then used for model input to determine required remediation times. While this method does indirectly account for mass transport limitations, problems may arise when one attempts to quantitatively describe several processes with lumped parameters. One primary concern is whether the lumped parameter is suitable for use only under the laboratory conditions in which it was applied, or whether it can be transferred for modeling use in the field.

The most direct method of accounting for mass transport limitations is to incorporate mass transfer coefficients directly into convective-dispersive vapor transport models. While vapor transport models incorporating mass transfer coefficients are currently not available, model development in this area is expected to occur relatively quickly.

ENHANCED AEROBIC BIODEGRADATION

With the exception of a few field research projects, soil vacuum extraction has been applied primarily for removal of volatile organic compounds from the vadose zone. However, circulation of air in soils can be expected to enhance the aerobic biodegradation of both volatile and semivolatile organic compounds. One of the most promising uses of this technology is in manipulating subsurface oxygen levels to maximize in-situ biodegradation. Bioventing can reduce vapor treatment costs and can result in the remediation of semivolatile organic compounds which cannot be removed by physical stripping alone.

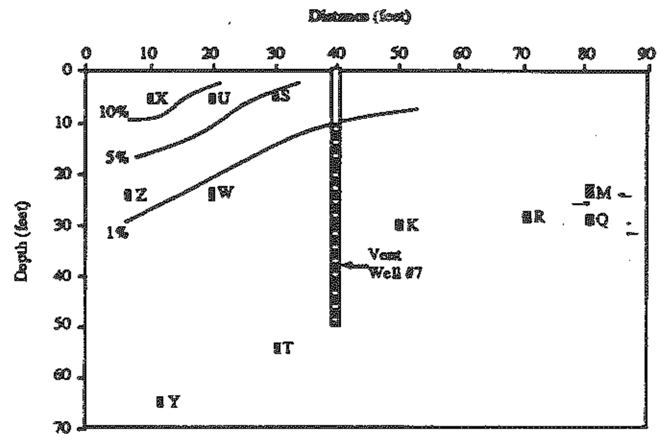

Figure 11. Oxygen concentration in vadose zone before venting.

SVE circulates air in soils at depths much greater than are possible by tilling, and oxygen transport via the gas phase is much more effective than injecting or flooding soils with oxygen saturated liquid solutions. It is also possible that enhanced biodegradation of semivolatiles may increase the volatilization of VOCs through the biodegradation of oily material with which the VOCs are associated.

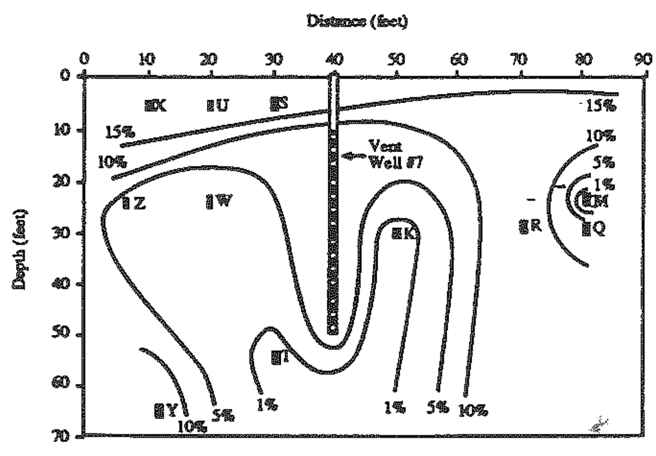

Figure 12. Oxygen concentration in vadose zone after venting.

Hinchee (1989) described the use of soil vacuum extraction at Hill AFB, Utah for oxygenation of the subsurface and the enhancement of biodegradation of petroleum hydrocarbons in soils contaminated with JP-4 jet fuel. Figures 11 and 12 illustrate subsurface oxygen profiles at the Hill site prior to and during SVE. It is evident that soil oxygen levels dramatically increased following one week of venting. Soil vapor samples collected from observation wells during periodic vent system shutdown revealed rapid decreases in oxygen concentration and corresponding CO_2 production verifying that aerobic biodegradation was indeed occurring at the site. Laboratory treatability studies using soils from the site demonstrated increased carbon-dioxide evolution with increasing moisture content when enriched with nutrients. It is worthwhile to note that soils at Hill AFB were relatively dry at commencement of field vacuum extraction indicating, that the addition of moisture could perhaps stimulate aerobic biodegradation even further under field operating conditions.

When conducting site characterization and field studies, it is recommended that CO_2 and O_2 levels be monitored in soil vapor probes and extraction well offgas to allow the assessment of basal soil respiration and the effects of site management on subsurface biological activity. These measurements are simple and inexpensive to conduct and can yield a wealth of information regarding:

1. the mass of VOCs and semivolatiles which have undergone biodegradation versus volatilization. This information is crucial if subsurface conditions (e.g., moisture content) are to be manipulated to enhance biodegradation to reduce VOC offgas treatment costs and maximize semivolatile removal,

2. factors limiting biodegradation. If O_2 and CO_2 monitoring reveals low O_2 consumption and CO_2 generation while readily biodegradable compounds persist in soils, further characterization studies could be conducted to determine if biodegradation is being limited by insufficient moisture content, toxicity (e.g. metals), nutrients, etc.

3. subsurface air flow characteristics. Observation wells which indicate persistent, low O_2 levels indicate an insufficient supply of soil gas at that location suggesting the need for higher extraction well vacuum, the need for additional extraction wells, or additional soils characterization information to identify areas with high moisture content or where immiscible fluids impede the flow of air. In this instance, it may be necessary to place a high density of extraction wells with corresponding high applied vacuum and possibly even the use of injection wells to induce air flow in selected soil areas.

LOCATION AND NUMBER OF VAPOR EXTRACTION WELLS

One of the primary objectives in conducting a SVE field test is to evaluate the initial placement of extraction wells to optimize VOC removal from soil. Placement of extraction wells and selected applied vacuum is largely an iterative process requiring continual re-evaluation as additional data are collected during remediation. Vacuum extraction wells produce complex three-dimensional reduced pressure zones in affected soils. The size and configuration of this affected volume depends on the applied vacuum, venting geometry (e.g., depth to water table), soil heterogeneity, and intrinsic (e.g., permeability) and dynamic (e.g., moisture content) properties of the soil. The lateral extent of this reduced pressure zone (beyond which static vacuum is no longer detected) is often termed the radius or zone of influence (ROI). Highly permeable sandy soils typically exhibit large zones of influence and high air flow rates whereas less permeable soils, such as silts and clays, exhibit smaller zones of influence and low air flows.

Measured or anticipated radii of influence are often used to space extraction wells. For instance, if a ROI is measured at 10 feet, extraction wells are placed 20 feet apart. This strategy though is questionable since as illustrated in Figures 13 and 14, vacuum propagation (2) and air velocity (12) decrease substantially with distance from an extraction well. Thus, only a limited volume of soil near an extraction well will be effectively ventilated regardless of the ROI. Johnson and Sterrett (1988) describe how the addition of 13 extraction wells within the ROI of other extraction wells increased blower VOC concentration by 4000 ppmv and mass removal by 40 kg/day. They concluded that the radius of influence was not an effective parameter for locating extraction wells and that operation costs could be reduced by increasing the number of extraction wells as opposed to pumping at higher rates with fewer wells.

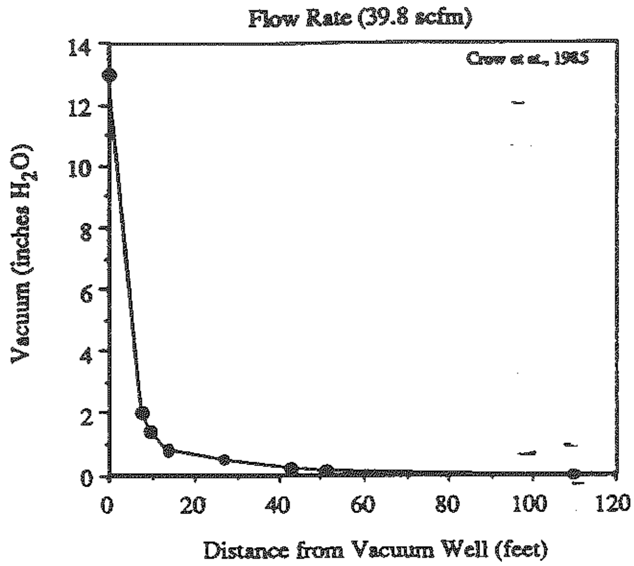

Figure 13. Vacuum vs. Distance from vacuum well.

Determining the propagation of induced vacuum requires conducting pneumatic pump tests in which variation in static vacuum is measured in vapor observation wells at depth and distance from extraction wells. Locating extraction and observation wells along transects as illustrated in Figure 9 minimizes the number of observation wells necessary to evaluate vacuum propagation at linear distances from extraction wells. Pressure differential can be observed at greater distances than would otherwise be possible in other configuration.

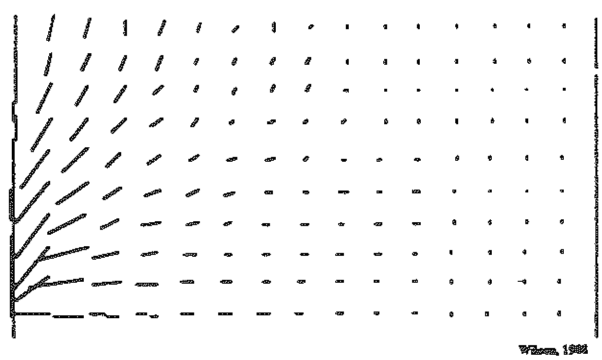

Figure 14. Air velocity field near an extraction well.

Propagation of vacuum in soils as a function of applied vacuum can be determined by conducting pneumatic pump tests with incrementally increasing flow or applied vacuum. Vacuum is increased after steady state conditions (relatively constant static vacuum measurements in observation wells) exist in soils from the previous applied vacuum. Conductance of a step pump test will indicate a significant increase in static vacuum or air velocity with increasing applied vacuum near an extraction well. However, at distance from an extraction well, a significant increase in static vacuum or air velocity will not be observed with an increase in applied vacuum. Pneumatic pump tests allow determination of radial distances from extraction wells in which air velocity is sufficient to ensure remediation.

After initial placement of extraction wells has been established based on the physics of air flow, an initial applied vacuum must be selected to ensure optimal VOC removal. In regard to mass transfer considerations, the vent rate should be increased if a significant corresponding mass flux is observed. Even though an increased vent rate may not substantially increase the propagation of vacuum with distance, air velocity will increase near the extraction well. If most contaminants are in more permeable deposits, an increase in applied vacuum will increase mass removal eventually to a point of diminishing returns or until the system is limited by diffusion.

During a field test, it is desirable to operate until mass transport limitations are realized to evaluate the long term performance of the technology. This can be achieved by isolating small selected areas of a site by the use of passive air inlet wells. When attempting to drive SVE to diffusion limited mass removal in isolated areas, applied vacuum should remain high and the distance between passive inlet and extraction wells should be minimized. Too often, SVE field tests are conducted for relatively short periods of time (e.g., 2 - 21 days) which only result in assessment of air permeability and initial mass removal. Longer field studies (e.g., 6 months - 12 months) enable better insight into mass transfer limitations which eventually govern SVE effectiveness.

SCREENED INTERVAL

The screened interval of extraction wells will play a significant role in directing air flow through contaminated soils. Minimum depths are recommended by some practitioners for SVE operation to avoid short-circuiting of air flow. However, the application of SVE need not be limited by depth to water table since horizontal vents can be used in lieu of vertically screened extraction wells to remediate soils with shallow contamination. Extraction wells generally do not circulate air effectively below their screened interval. For remediation of highly permeable soils with deep contamination, an extraction well should be discretely screened at the maximum depth of contamination or to the seasonal low water table, whichever is shallowest, to direct air flow and reduce short-circuiting. For less permeable soils, or for more continuous vertical contamination, a higher and longer screened interval may be useful. In stratified systems, such as in the presence of clay layers between more permeable deposits, more than one well may be required, each venting a distinct strata. Screening an extraction well over two strata of significantly different permeability will result in most air flow being directed only in the strata of greater permeability.

During venting, the reduced pressure in the soil will cause an upwelling of the water table (5). The change in water table elevation can be determined from the predicted radial pressure distribution. Johnson et al. (1988) indicated that upwelling can be significant under typical venting conditions. If the water table does rise, and the contaminated zone lies just above the water table, ground water can then become contaminated, the contaminated soil zone will become saturated, and overall mass removal rates will be drastically lowered. The authors suggest maintaining the ground water below the region of contamination to minimize adverse effects of ground water upwelling due to SVE system operation.

PLACEMENT OF OBSERVATION WELLS

Observation wells are essential in determining whether contaminated soils are being effectively ventilated and in the evaluation of interactions among extraction wells. The more homogeneous and isotropic the unsaturated medium, the fewer the number of vapor monitoring probes required. To adequately describe vacuum propagation during a field test, usually at least three observation well clusters are needed within the ROI of an extraction well. At least one of these clusters should be placed near an extraction well because of a logarithmic decrease in vacuum with distance. The depth and number of vapor probes within a cluster depends on the screened intervals of extraction wells and soil stratigraphy. However, vertical placement of vapor probes might logically be near the soil-water table interface, soil horizon interfaces, and near the soil surface. As previous mentioned, the use of air flow modeling can assist in optimizing the depth and placement of vapor observation wells and in the interpretation of data collected from these monitoring points.

When constructing the observation wells, metal (e.g., brass, aluminum, stainless steel) sampling lines and screens should be utilized instead of teflon or other materials which may absorb contaminants. Because of contaminant absorption, teflon may impart contaminant "memory" when sampling. Also, when constructing observation wells it is desirable to minimize vapor storage volume in the screened interval and sample transfer line. This will minimize purging volumes and ensure a representative vapor sample in the vicinity of each observation well.

Analysis of soil gas in an on-site field laboratory is preferred to provide real time data for implementation of engineering controls and process modifications. It is recommended that steel canisters, sorbent tubes, or direct GC injection be used lieu of Tedlar bags when possible because of potential VOC loss through bag leakage or diffusion within the teflon material itself. This problem may lead to erroneous analytical results and the potential of a false negative indication of soil remediation at low soil gas concentrations.

USE OF PASSIVE OR ACTIVE INJECTION WELLS WITH OR WITHOUT SURFACE SEALING

Surface covering or sealing in combination with passive or active air injection has been utilized to promote horizontal air flow or to force air through pneumatically resistant soil. Injection wells are typically placed at the perimeter of a site, while extraction wells are placed in areas of high contamination. The usefulness of surface barriers is disputable. In Crow et al. (1987), the effectiveness of passive air inlet wells with an impermeable cover was evaluated by measuring flow into the inlet wells as a fraction of flow from extraction wells at three flow rates. The air inlet wells comprised only a small fraction (9.2, 9.5 and 10.8%) of the total exhaust. The most significant impact on vacuum extraction from surface sealing may be a decrease in soil moisture content due to decreased infiltration. This would have a positive effect on air conductivity but potentially a negative effect on microbial activity and VOC sorption. The effect of surface sealing and air injection can be evaluated by conducting pneumatic pump tests with the inlet wells closed and open. Air flow into the inlet wells can be measured with a hot wire anemometer to determine the percentage of extracted air originating at the inlet wells. It is recommended that when one elects to use engineering modifications such as covers in a SVE system, that their effectiveness be demonstrated during a field test so such results may assist others in determining whether to use similar engineering modifications during SVE operation at other sites.

SUMMARY/CONCLUSIONS

While the application of soil vacuum extraction is conceptually simple, its success depends on understanding complex subsurface physical, chemical, and biological processes which provide insight into factors limiting SVE performance. Optimizing SVE performance is critical when attempting to meet stipulated soil-based clean-up levels required by regulators. The first step in evaluating SVE application is to assess contaminant volatility. Volatility is a function of a contaminant's soil-water partition coefficient and Henry's constant if present in a three-phase system, and a contaminant's vapor pressure and mole fraction in an immiscible fluid, if present in a four phase system. Volatility is greatly decreased when soils are extremely dry. As vacuum extraction proceeds, lower molecular weight organic compounds preferentially volatilize and biodegrade. Decreasing mole fractions of lighter compounds and increasing mole fractions of heavier compounds affect observed offgas concentrations. Understanding contaminant volatility is necessary when attempting to utilize offgas vapor concentrations as an indication of SVE progress.

The significance of mass transport limitations should be evaluated during SVE field tests. Long term performance of SVE will most likely be limited by diffusion from soil regions of lesser permeability which are not exposed to direct airflow. Mass transport limitations can be assessed by isolating a small area of a site and aggressively applying vacuum extraction. Simplistic methods to evaluate remediation time as described by Terra-Vac (1989) should be avoided. One of the most promising uses of vacuum extraction is in manipulating subsurface oxygen levels to enhance biodegradation. When conducting field studies, it is recommended that CO_2 and O_2 levels be monitored in vapor probes to evaluate the feasibility of VOC and semivolatile contaminant biodegradation.

Air permeability in soil is a function of a soil's intrinsic permeability and liquid content. Relative permeability of air can be predicted using relationships developed by Brooks and Corey (1964) and Van Genuchten (1980). The most effective method of measuring air permeability is by conducting pneumatic pump tests. Information gained from pneumatic pump tests can be used to determine site-specific design considerations such as the spacing of extraction wells. Measured or anticipated zones of influence are not particularly useful in spacing extraction wells. Extraction wells should be located to maximize air velocity in contaminated soils. Pneumatic pump tests with increasing applied vacuum may be useful in determining radial distances from extraction wells in which air velocity is sufficient to ensure remediation. Extraction wells generally do not circulate air effectively below their screened interval. Screened intervals should be located at or below the depth of contamination. In stratified soils, more than one well may be necessary to ventilate each strata. At least three observation well clusters are usually necessary to observe vacuum propagation within the radius of influence of an extraction well. Logical vertical placement of vapor probes might be near the soil-water table interface, soil horizon interfaces, and near the soil surface. Teflon should be avoided when constructing vapor probes and for storage of gas samples. Lastly, the effect of engineering modifications such as surface sealing should be demonstrated during a field test to assist others in determining whether to use similar modifications at other sites.

DISCLAIMER

This paper has not been sujected to Agency review and therefore does not necessarily reflect the views of the U.S. Environmental Protection Agency.

REFERENCES

(1) Baehr, A.L., and Corpacioglu, 1987. A Compositional Multiphase Model for Ground-Water Contamination by Petroleum Products. 2: Numerical Solution, Water Resources Research, Vol. 23, No. 1, pp 201-213.

(2) Crow, W.L., Andersen, E.P., and Minugh, E.M., 1985. "Subsurface Venting of Vapors Emanating from Hydrocarbon Product on Ground Water," Final Report, American Petroleum Institute, September 1985.

(3) Hinchee, R.E., 1989. Enhanced Biodegradation Through Soil Venting, Proceedings of theWorkshop on Soil Vacuum Extraction, Robert S. Kerr Environmental Research Laboratory, Ada, Oklahoma, April 27-28, 1989.

(4) Johnson, J.J. and Sterrett, R.J. 1988. Analysis of In Situ Air Stripping Data, Proceedings of the 5th National Conference on Hazardous Wastes and Hazardous Materials, HMCRI, Las Vegas, NV, April 19-21, 1988, pp. 451-455.

(5) Johnson, P.C., Kemblowski, M.W., and Colthart, J.D., 1988. Practical Screening Models for Soil Venting Applications, NWWA/API Conference on Petroleum Hydrocarbons and Organic Chemicals in Groundwater, Houston, TX, 1988.

(6) Johnson, R.L., 1989. Soil Vacuum Extraction: Laboratory and Physical Model Studies, Proceedings of the Workshop on Soil Vacuum Extraction, Robert S. Kerr Environmental Research Laboratory, Ada, Oklahoma, April 27-28, 1989.

(7) Massmann, J.W., 1989. "Applying Groundwater Flow Models in Vapor Extraction System Design," Journal of Environmental Engineering, Vol. 115, No. 1, February, 1989, pp. 129-149.

(8) Rawls, W.J., Brakensiek, D.L., and Saxton, K.E., 1982. Estimation of Soil Water Properties, Transactions of the ASAE, 1982, pp. 1316-1328.

(9) Spencer, W.F., Claith, M.M., and Farmer, W.J., 1969. Soil Sci. Am. Proc. 33, 509-511.

(10) Terra-Vac In Situ Vacuum Extraction System, Applications and Analysis Report, 1989. U.S. Environmental Protection Agency, Cincinnati, OH, EPA/540/A5-89/003.

(11) Van Genuchten, M.T., 1980. A Closed-form Equation for Predicting the Hydraulic Conductivity of Unsaturated Soils, Soil Sci. Soc. Am. J., 44:982-898.

(12) Wilson, D.J., 1989. Modeling of Soil Vapor Stipping, Proceedings of the Workshop on Soil Vacuum Extraction, Robert S. Kerr Environmental Research Laboratory, Ada, Oklahoma, April 27-28, 1989.

BIOGRAPHICAL SKETCHS

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WASTE MANAGEMENT DIVISION
EPA, REGION V

Toward A Cleaner Environment
15 Year Anniversary 1972 - 1987

Richard F. Celeste
Governor

June 11, 1990

Re: Vernitron Piezoelectric
U.S. EPA ID No.: OHD052324290
Ohio Permit No.: 02-18-0649
Amendment to Closure Plan

Vernitron Piezoelectric
Attn: Mr. Ron Roch
232 Forbes Road
Bedford, Ohio 44146

File in Part A

Dear Mr. Roch:

A public notice acknowledging the Ohio EPA's receipt of an amendment to the closure plan for Vernitron Piezoelectric located at 232 Forbes Road, Bedford, Ohio will appear the week of June 11, 1990, in the Plain Dealer, Cleveland, Ohio. The Director of the Ohio EPA will act upon the amendment to the closure plan request following the close of the public comment period, July 17, 1990.

Copies of the amendment to the closure plan will be available for public review at the Cleveland Public Library, 325 Superior Avenue, Cleveland, Ohio 44114 and the Ohio EPA, Northeast District Office, 2110 East Aurora Road, Twinsburg, Ohio 44087.

I may be contacted at (614) 644-2977 if you have any questions concerning this matter.

Very truly yours,

Thomas E. Crepeau

Thomas E. Crepeau, Manager
Data Management Section
Division of Solid & Hazardous Waste Management

TC/RS/ds

cc: Lisa Pierard, U.S. EPA, Region V
Randy Meyer, Ohio EPA, DSHWM, RCRA TAS
Greg Taylor, Ohio EPA, DSHWM, NEDO

2518R(56)

PUBLIC NOTICE Cuyahoga County

RECEIPT OF AMENDMENT TO HAZARDOUS WASTE CLOSURE PLAN

For: Vernitron Piezoelectric, 232 Forbes Road, Bedford, Ohio 44146, U.S. EPA ID No.: OHD052324290, Ohio Permit No.: 02-18-0649. Pursuant to OAC Rule 3745-66-10 thru 17 and 40 CFR, Subpart G, 265.110 thru 117, the Ohio Environmental Protection Agency (Ohio EPA) is hereby giving notice of the receipt of an amendment to the Hazardous Waste Facility Closure Plan for Hazardous Waste Storage Areas for the above referenced facility. Ohio EPA is also giving notice that this facility is subject to a determination concerning corrective action, a requirement under the Hazardous and Solid Waste Amendments of 1984, which concerns any possible uncorrected releases of hazardous waste or hazardous constituents to the environment from any current or previous solid waste management units at the above facility. A corrective action determination is required from hazardous waste facilities intending to close.

Copies of the facility's Amendment to the Closure Plan will be available for public review at the Cleveland Public Library, 325 Superior Avenue, Cleveland, Ohio 44114 and the Ohio EPA, Northeast District Office, 2110 East Aurora Road, Twinsburg, Ohio 44087. Comments concerning the Amendment to the Closure Plan or factual information concerning any releases of hazardous waste or hazardous waste constituents by the above facility requiring corrective action should be submitted within 30 days of this notice to: Ohio Environmental Protection Agency, Div. of Solid & Hazardous Waste Mgmt., Data Management Section, Attn: Thomas E. Crepeau, Box 1049, Columbus, Ohio 43266-0149.

PUBLIC NOTICE Cuyahoga County

RECEIPT OF HAZARDOUS WASTE CLOSURE PLAN

For: Vernitron Piezoelectric Division, US EPA ID No.: OHD052324290, 232 Forbes Road, Bedford, Ohio 44146. Pursuant to OAC Rule 3745-66-10 thru 17 and 40 CFR, Subpart G, 265.110 thru 117, the Ohio Environmental Protection Agency (Ohio EPA) is hereby giving notice of the receipt of a Hazardous Waste Facility Closure Plan for the above referenced facility. Ohio EPA is also giving notice that this facility is subject to a determination concerning corrective action, a requirement under the Hazardous and Solid Waste Amendments of 1984, which concerns any possible uncorrected releases of hazardous waste or hazardous constituents to the environment from any current or previous solid waste management units at the above facility. A corrective action determination is required from hazardous waste facilities intending to close.

Copies of the facility's Closure Plan will be available for public review at the Cleveland Public Library, 325 Superior Avenue, Cleveland, Ohio 44114, and the Ohio EPA, Northeast District Office, 2110 E. Aurora Road, Twinsburg, Ohio 44087.

Comments concerning the Closure Plan or factual information concerning any releases of hazardous waste or hazardous waste constituents by the above facility requiring corrective action should be submitted within 30 days of this notice to: Ohio Environmental Protection Agency, Div. of Solid & Hazardous Waste Mgmt., Program Planning and Management Section, Attn: James F. Flautt, Box 1049, 361 E. Broad Street, Columbus, Ohio 43216-1049.

File in Part A

VERNITRON CORPORATION
645 MADISON AVENUE, NEW YORK, NY 10022 □ (212) 593-7900 □ FAX: (212) 754-6348

February 20, 1990 OHD 052 324 290

EXECUTIVE OFFICES

RECEIVED
FEB 27 1991
OFFICE OF RCRA
Waste Management Division
U.S. EPA, REGION V.

BY TELECOPIER

Mr. Tom Crepeau
State of Ohio Environmental Protection Agency
PO Box 1049
1800 WaterMark Drive
Columbia, OH 43266-0149

Dear Mr. Crepeau:

I refer to the letter dated January 8, 1991 of Richard L. Shank to Mr. Ron Roch of the Vernitron Piezoelectric Division regarding the closure plan submitted by the Division on December 19, 1989. A copy of Mr. Shank's letter is attached. As stated in Mr. Shank's letter, the Division has 30 days from the date of receipt of his letter (which was January 28, 1991) to submit a modified closure plan addressing the deficiencies enumerated in Mr. Shank's letter. Further to our conversation last week, I hereby formally request a 60-day extension of time, until April 28, 1991, to submit a modified closure plan. Kindly confirm in writing that this is acceptable.

I look forward to working with you on this matter.

Sincerely,

Elliot Konopko/mh

Elliot Konopko

EK:mh
Attachment

cc: Joel Morbito
Lisa Pierard extra copy
Greg Taylor
Paul Vandermeer
Richard L. Shank

OhioEPA

State of Ohio Environmental Protection Agency

P.O. Box 1049, 1800 WaterMark Dr.
Columbus, Ohio 43266-0149

Richard F. Celeste
Governor

CERTIFIED MAIL
JAN 23 1991

NOTICE OF DEFICIENCY

January 8, 1991

Mr. Ron Roch
Vernitron Piezoelectric Division
232 Forbes Road
Bedford, Ohio 44146

RE: CLOSURE PLAN

Vernitron Piezoelectric Division
OHD 052 324 290

Dear Mr. Roch:

On December 19, 1989, Ohio EPA received from Vernitron Piezoelectric Division a closure plan for a drum storage area located at 232 Forbes Road, Bedford, Ohio.

This closure plan was submitted pursuant to Rule 3745-66-12 of the Ohio Administrative Code (OAC) in order to demonstrate that the Vernitron Piezoelectric Division proposal for closure complies with the requirements of OAC Rules 3745-66-11 and 3745-66-12.

The public was given the opportunity to submit written comments regarding the closure plan in accordance with OAC Rule 3745-66-12. The public comment period extended from June 11, 1990 through July 17, 1990. No public comments were received by Ohio EPA.

Pursuant to OAC 3745-66-12(D)(4), I am providing you with a statement of deficiencies in the plan, outlined in Attachment A.

Please take notice that OAC Rule 3745-66-12 requires that a modified closure plan addressing the deficiencies enumerated in Attachment A be submitted to the Director of the Ohio EPA for approval within thirty (30) days of the

Mr. Roch
Page Two

receipt of this letter. The modified closure plan should be submitted to: Ohio Environmental Protection Agency, Division of Solid and Hazardous Waste Management, Attn: Thomas Crepeau, Manager, Data Management Section, P.O. Box 1049, Columbus, Ohio 43266-0149. A copy should also be sent to: Greg Taylor, Ohio EPA, Northeast District Office, 2110 East Aurora Road, Twinsburg, Ohio 44087.

Upon review of the resubmitted plan, I will prepare and issue either a draft or a final action approving or modifying such plan. If you wish to arrange a meeting to discuss your responses to this Notice of Deficiency, please contact Paul Vandermeer, Ohio EPA, DSHWM, Central Office (614) 644-2956 or Greg Taylor at (216) 425-9171.

Sincerely,

Richard L. Shank, Ph.D.
Director

RLS/PV/pas

cc: Tom Crepeau, DSHWM, Central File, Ohio EPA 644-2329
Lisa Pierard, USEPA, Region V
Joel Morbito, USEPA, Region V
Greg Taylor, NEDO, Ohio EPA
Paul Vandermeer, CO, Ohio EPA

TOXCON ENGINEERING
[CO]MPANY, INC.

RECEIVED
SEP 19 1989
OFFICE OF RCRA
WASTE MANAGEMENT DIVISION
EPA, REGION V

September 7, 1989

Ms. Rebecca Strom
Waste Management Division
U.S. EPA, Region V
230 South Dearborn St.
Chicago, Illinois 60604

Re: Vernitron Piezoelectric Division
Request for Extension for Submittal of Amended Closure Plan
USEPA ID No. OHD052324290

Dear Ms. Strom:

This letter is written on behalf of Vernitron Corporation relating to the Vernitron Division of Morgan Matroc in Bedford, Ohio (Vernitron). This plant was owned until July 27, 1989 by Vernitron Corporation. The plant is now owned by Morgan Matroc Corporation, however, Vernitron is contractually responsible for certain on-site clean-up efforts.

Herein, Vernitron requests an additional sixty days to complete and submit the amended closure plan for this facility. The existing deadline of September 8, 1989 for the submittal of the amended closure plan is requested to be extended to November 9, 1989. The delay for the submittal of the amended closure plan is caused by time delays in receiving analytical results from the laboratory and delays in receiving vendor information for remediation equipment.

Several phases of sampling have been accomplished by Vernitron since August, 1988 and have helped in defining the extent of elevated levels of lead and solvents in the soil and ground water. The results of the most recent soil and ground water investigations that were completed in July, 1989 will be submitted to the U.S. EPA and Ohio EPA on November 8, 1989 along with the amended closure plan.

At this time the boundaries of the elevated lead and solvents concentrations have not been completely defined in all areas of the former hazardous waste storage area. However, adequate information is now available to develop an amended closure plan and Vernitron has concluded that it is prudent to change now from investigation to remediation.

Air Pollution Control
Toxic Chemicals
Process Engineering

3334 Richmond Ave., #200
Houston, Texas 77098
(713) 520-7667
Fax: (713) 524-9866

Vernitron plans to submit a closure plan that will involve a combination of soil removal and in-situ site remediation. The soils with levels of lead which cause the soil to be EP Toxic will be removed. Then a system of gas venting wells will be installed to remove the chlorinated solvents from the soils. In addition, a system of ground water recovery wells will be installed and the use of an air stripper is proposed to remove the chlorinated solvents from the ground water. Details will be submitted on or before November 8, 1989.

Should you have any questions or require further information as you review our request, please contact either Marten Mosis or me.

Regards,

Marten Mosis for

Robert Finkelstein
Engineer

cc: G. Taylor, Ohio EPA
R. Roch, Vernitron
T. Crepeau, Ohio EPA
B. Coyle, Vernitron
W. Ragals, Vernitron
K. Berlind

e:\vernit\strom3

OhioEPA
State of Ohio Environmental Protection Agency
P.O. Box 1049, 1800 WaterMark Dr.
Columbus, Ohio 43266-0149

Richard F. Celeste
Governor

CLOSURE PLAN EXTENSION APPROVAL

CERTIFIED MAIL

RECEIVED
AUG 17 1989
OFFICE OF RCRA
WASTE MANAGEMENT DIVISION
EPA, REGION V

August 14, 1989

Re: Closure Plan Extension Request
Vernitron Piezoelectric
OHD 052 324 290 TSD, 4
Part A

Mr. Ron Roch
Vernitron Piezoelectric
232 Forbes Road
Bedford, Ohio 44146

Dear Mr. Roch:

On March 14, 1989, Vernitron Piezoelectric submitted a request for an extension to the closure period specified in the approved closure plan for 180 days. The extension request was submitted pursuant to OAC Rule 3745-66-13(B) as closure will require longer than the 180 days period specified in OAC Rule 3745-66-13. Vernitron Piezoelectric has requested this extension due to the need to complete determination of the extent of contamination around the drum storage area.

Therefore, closure of the drum storage area will require greater than 180 days because of the discovery of contaminated soils. Vernitron Piezoelectric will continue to take all steps to prevent a threat to human health and the environment from the closed but inactive waste management unit per OAC Rule 3745-66-13(B)(2).

The public was given the opportunity to submit written comments regarding the request for an extension to the closure period for Vernitron Piezoelectric in accordance with OAC Rule 3745-66-13. The public notice appeared in the week of April 24, 1989, in the Cleveland Plain Dealer. No comments were received in this matter.

An extension of time allowed for closure is hereby granted through September 8, 1989 when the amended closure plan becomes due.

Please be advised that approval of this closure extension request does not release Vernitron Piezoelectric from any responsibilities as required under the Hazardous and Solid Waste Amendments of 1984 regarding corrective action for all releases of hazardous waste or constituents from any solid waste management unit, regardless of the time at which waste was placed in the unit.

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Paul Evans Date 8-14-89

Ohio Environmental Protection Agency
ENTERED DIRECTOR'S JOURNAL
AUG 14 1989

When closure is completed, the Ohio Administrative Code Rule 3745-66-15 requires the owner or operator of a facility to submit to the Director of the Ohio EPA certification by the owner or operator and a registered professional engineer that the facility has been closed in accordance with the approved closure plan. The owner or operator certification shall follow the format specified in OAC 3745-50-42(D). These certifications should be submitted to: Ohio Environmental Protection Agency, Division of Solid and Hazardous Waste Management, Attn: Tom Crepeau, Data Management Section, P.O. Box 1049, Columbus, Ohio 43266-0149.

You are notified that this action of the Director is final and may be appealed to the Environmental Board of Review pursuant to Section 3745.04 of the Ohio Revised Code. The appeal must be in writing and set forth the action complained of and the grounds upon which the appeal is based. It must be filed with the Environmental Board of Review within thirty (30) days after notice of the Director's action. A copy of the appeal must be served on the Director of the Ohio Environmental Protection Agency and the Environmental Enforcement Section of the Office of the Attorney General within three (3) days of filing with the Board. An appeal may be filed with the Environmental Board of Review at the following address: Environmental Board of Review, 250 East Town Street, Room 101, Columbus, Ohio 43266-0557.

Sincerely,

Richard L. Shank, Ph.D.
Director

RLS/PV/pas

cc: Tom Crepeau, DSHWM Central File, Ohio EPA
Lisa Pierard, USEPA, Region V
Greg Taylor, NEDO, Ohio EPA
Paul Vandermeer DSHWM, CO, Ohio EPA

1793U

2 FEB 1989

5H-12

Robert Finkelstein, Engineer
Vernitron Piezoelectric Division
232 Forbes Road
Bedford, Ohio 44146

RE: Closure Plan Extension
Vernitron Piezoelectric Division
Bedford, Ohio
OHD 052 324 290

Dear Mr. Finkelstein:

This is in response to your December 21, 1988, letter, which requested an extension of the deadline for the closure for the above-referenced facility. The extension request was submitted pursuant to 40 CFR 265.113(b)(1), because elevated levels of metals and organics were found in the soil and asphalt left in the outside container storage area.

The United States Environmental Protection Agency (U.S. EPA) has reviewed your request and it appears to be justified to facilitate cleanup, which was discussed in your partial closure activities report. The U.S. EPA is granting a 180-day extension from the original approved closure date, which was September 9, 1988. The new deadline for closure is now March 9, 1989.

If you have any questions pertaining to this extension, please contact Ms. Anita L. Boseman of my staff, at (312) 353-4734.

Sincerely,

Basil G. Constantelos, Director
Waste Management Division

cc: Gregory Taylor, OEPA-NEDO
Randy Meyer, OEPA
Tony Sasson, OEPA
Cas Stevens, Vernitron
Ronald Roch, Vernitron

5HR:BOSEMAN:bd:01/24/89

Disk #1

JP 1/26/89 JCM 1-30-89 EP 1-31-89

RCRA PERMITS	TYP.	AUTH.	IL. CHIEF	IN. CHIEF	MI. CHIEF	MN/WI CHIEF	OH. CHIEF	RPB CHIEF	O.R. A.D.D.	WMD DIR
INIT. DATE	ABD 1/25/89	ALB 1/26/89					JP 1-26-89	AEP 1/27/89	WEM 1/26/89	for

CWMD 1/31/89

TOXCON ENGINEERING COMPANY, INC.

Anita

December 16, 1988

Ms. Rebecca Strom
Waste Management Division
U.S. EPA, Region 5
230 South Dearborn St.
Chicago, Illinois 60604

RECEIVED
DEC 21 1988
OFFICE OF RCRA
Waste Management Division
U.S. EPA, REGION V

Re: Vernitron Piezoelectric Division
Request for Extension for Partial Closure Deadline
USEPA ID No. OHD052324290

Dear Ms. Strom:

This letter is written on behalf of Mr. Ron Roch, Plant Manager of Vernitron Piezoelectric Division in Bedford, Ohio (Vernitron).

The Partial Closure Plan as modified and approved by the Ohio EPA on May 7, 1987 and approved by the U.S. EPA on June 9, 1988 was implemented at Vernitron Piezoelectric Division in Bedford, Ohio in August, 1988. Additional closure activities and soil investigations were implemented in November, 1988 to address concerns that arose during the August, 1988 clean-up activities.

Due to unexpected investigation results from the August and November, 1988 clean-up activities, the partial closure of the former outside storage area for hazardous waste cannot be completed within the time frame proposed in Vernitron's Partial Closure Plan as approved and modified by the Ohio EPA and the U.S. EPA.

An extension of 180 days from today is requested to ensure that the investigative, analytical, and clean closure activities are performed properly and completely. An amended partial closure plan will be submitted for approval to the Ohio EPA and the U.S. EPA by January 31, 1989.

Please notify Marten Mosis or myself when a determination on this extension request is made.

Regards,

Deborah Romanowski For
Robert Finkelstein

cc: G. Taylor, Ohio EPA
R. Roch, Vernitron
T. Crepeau, Ohio EPA
B. Coyle, Vernitron
W. Ragals, Vernitron

e:\vernit\strom

Air Pollution Control
Toxic Chemicals
Process Engineering

3334 Richmond Ave., #200
Houston, Texas 77098
(713) 520-7667
Fax: (713) 524-9866

TOXCON ENGINEERING COMPANY, INC.

November 4, 1988

Ms. Rebecca Strom
Waste Management Division
United States Environmental Protection Agency, Region 5
230 South Dearborn St.
Chicago, Illinois 60604

RECEIVED
NOV 7 1988
OFFICE OF RCRA
Waste Management Division
U.S. EPA, REGION V

Re: Partial Closure Project
Vernitron Piezoelectric Division
232 Forbes Road
Bedford, Ohio

Dear Ms. Strom:

The Partial Closure Project at the Vernitron Piezoelectric Division (VPD) facility in Bedford, Ohio was implemented during the week of August 22, 1988 according to Vernitron's December 15, 1986 Partial Closure Plan as approved and modified by the Ohio EPA on May 7, 1987 and approved by the U. S. EPA on June 9, 1988. The attached report discusses the partial closure activities, analytical data, and recommendations of investigative activities VPD proposes to implement upon receipt of approval from you and Ohio EPA.

In addition to the investigative activities discussed in the report, VPD proposes to screen soils in the areas where asphalt has been removed using an HNU photoionization detector. If volatiles are detected, the affected soils will be excavated and added to the already excavated soils for disposal later. VPD plans to do the screening and any necessary excavation on November 14, 1988.

Should you have any questions or require additional information please call me.

Regards,

Robert Finkelstein

Robert Finkelstein
Engineer

RECEIVED
NOV 14 1988
U. S. EPA, REGION V
SWB — PMS

cc: R. Roch, Vernitron
C. Stevens, Vernitron
B. Coyle, Vernitron
W. Ragals, Vernitron
G. Taylor, Ohio E.P.A.

Air Pollution Control
Toxic Chemicals
Process Engineering

3334 Richmond Ave., #200
Houston, Texas 77098
(713) 520-7667
Fax: (713) 524-9866

TOXCON ENGINEERING COMPANY, INC.

November 4, 1988

Gregory Taylor
Environmental Scientist
Division of Solid and Hazardous Waste Management
Ohio EPA, North East District Office
2110 East Aurora Road
Twinsburg, Ohio 44067

RECEIVED
NOV 14 1988
U. S. EPA, REGION V
SWB — PMS

Re: Partial Closure Project
Vernitron Piezoelectric Division
232 Forbes Road
Bedford, Ohio

Dear Mr. Taylor:

The Partial Closure Project at the Vernitron Piezoelectric Division (VPD) facility in Bedford, Ohio was implemented during the week of August 22, 1988 according to Vernitron's December 15, 1986 Partial Closure Plan as approved and modified by the Ohio EPA on May 7, 1987 and approved by the U. S. EPA on June 9, 1988. The attached report discusses the partial closure activities, analytical data, and recommendations of investigative activities VPD proposes to implement upon receipt of your approval.

In addition to the investigative activities discussed in the report, VPD proposes to screen soils in the areas where asphalt has been removed using an HNU photoionization detector. If volatiles are detected, the affected soils will be excavated and added to the already excavated soils for disposal later. VPD plans to do the screening and any necessary excavation on November 14, 1988.

The report recognizes the need to obtain a waste classification for the excavated asphalt pile. We request a waste classification from Ohio EPA for this material.

We would like to meet with you on Tuesday, November 15, 1988 in the morning (8:00 AM, if possible) to discuss the investigation plans and to obtain your comments. At that time, we can share with you our findings from our November 14, 1988 efforts.

Air Pollution Control
Toxic Chemicals
Process Engineering

3334 Richmond Ave., #200
Houston, Texas 77098
(713) 520-7667
Fax: (713) 524-9866

Should you have any questions or require additional information please call me.

Regards,

Robert Finkelstein

Robert Finkelstein
Engineer

cc: R. Roch, Vernitron
C. Stevens, Vernitron
B. Coyle, Vernitron
W. Ragals, Vernitron
R. Strom, U.S.E.P.A.

9 JUN 1988

CERTIFIED MAIL P#707 061 653
RETURN RECEIPT REQUESTED

5H-12

Cas Stevens, Safety Director
Venitron Piezoelectric Division
Venitron Corporation
232 Forbes Road
Bedford, Ohio 44146-5478

RE: Closure Plan
Venitron Piezoelectric
Division
OHD 052 324 290

Dear Mr. Stevens:

The United States Environmental Protection Agency (U.S. EPA) received a copy of the above-referenced facility's closure plan on June 11, 1987. This plan was previously submitted to the Ohio Environmental Protection Agency (OEPA) on December 15, 1986. The plan concerned the closure of an indoor hazardous waste storage area and an outdoor hazardous waste drum storage area located at the facility.

The public was given the opportunity to submit written comments regarding the closure plan of Venitron Piezoelectric, in accordance with 40 CFR 265.112. No comments were received by the OEPA in this matter.

The OEPA approved the plan, conditionally, in a letter dated May 7, 1987. The U.S. EPA approves the closure plan submitted by Venitron Piezoelectric, with the conditions stipulated by the OEPA letter on May 7, 1987.

If you have any further questions, please contact Ms. Rebecca Strom of my staff, at (312) 886-6194.

Sincerely,

Basil G. Constantelos, Director
Waste Management Division

cc: Randy Meyer, OEPA
Tony Sasson, OEPA
Debbie Berg, OEPA-NEDO

bcc: File

5HS-13:Strom:vmc 05/31/88 Disk #4

Cuy 6-2-88

RCRA PERMITS INIT. DATE	TYP.	AUTH.	IL. CHIEF	IN.	MI	MN/WI CHIEF	OH CHIEF	RPB	O.R. A.D.D.	WMD DIR
6/2/88	Vc	BLS					GA 6/2/88	6/3/88	WEM 6/6/88	6/7

Vernitron Piezoelectric Division
232 Forbes Road / Bedford, Ohio 44146 / (216) 232-8600

RECEIVED
MAY 27 1988
WMD-
EPA, REG

RECEIVED
MAY 27 1988
SOLID WASTE BRANCH
U.S. EPA, REGION V

May 24, 1988

Mr. George Hamper, Chief
Waste Management Division
Technical Programs Section
Ohio Unit, USEPA, Region V, 5HS-13
230 South Dearborn Street
Chicago, IL 60604

Dear Sir:

Please advise us of the status of the Vernitron Piezoelectric Division Hazardous Management Plan, revised 12/10/86, that was sent to you June 4, 1987. (copy of cover letter attached). This plan contains the OHIOEPA conditional approval for a partial closing of the Vernitron Piezoelectric Division hazardous waste storage areas to allow changing our permit status to Generator. (copy of OHIOEPA conditional approval attached)

We are anxious to complete this change in our permit status.

Sincerely,

Cas Stevens

Cas Stevens
Quality Control Manager

Attachments: Cover letter dated June 4, 1987
OHIOEPA Conditional Approval dated May 7, 1987

Copies:
Ms. Deborah Berg, District Supervisor
Ohio EPA Northeast District Office

Mr. Neal Winnig, Vernitron Corporation
Ms. Pat Martel, Vernitron Corporation
Mr. Robert Finkelstein, Toxcon Engineering Company
Mr. Ronald Roch
Mr. Kenneth Kupcak

Vernitron Piezoelectric Division
232 Forbes Road / Bedford, Ohio 44146 / (216) 232-8600

June 4, 1987

RECEIVED
JUN 08 1987
SOLID WASTE BRANCH
U.S. EPA, REGION V

Mr. George Hamper, Chief
Waste Management Division
Technical Programs Section
Ohio Unit, USEPA, Region V, 5HS-13
230 South Dearborn Street
Chicago, IL 60604

Dear Sir:

I am sending you a copy of the Vernitron Diezoelectric Division Hazardous Management Plan, revised 12/10/86. This Plan contains an outline and conditional approval, Ohio EPA, for a partial closing of Vernitron Piezoelectric Division's hazardous waste storage areas to allow changing our permit status to Generator.

The authorization for submitting this Plan to you for your approval is contained in the Ohio EPA Letter of Conditional Approval dated May 7, 1987 (see VPD Partial Closure section).

Sincerely,

Cas Stevens

Cas Stevens
Quality Control Manager

Attachment: Vernitron Piezoelectric Division Hazardous Management Plan

Copies (Letter of Transmittal only) to:
Mr. Thomas Crepeau
Rebecca Strom, USEPA, Region V
Debby Berg, Ohio EPA, NEDO

OhioEPA
State of Ohio Environmental Protection Agency

P.O. Box 1049, 361 E. Broad Street
Columbus, Ohio 43266-1049
(614) 466-8565

Richard F. Celeste
Governor

CERTIFIED MAIL

May 7, 1987

Re: CLOSURE PLAN
VERNITRON PIEZOELECTRIC
OHD052324290/02-18-0648

RECEIVED
MAY 14 1987
SOLID WASTE BRANCH
U.S. EPA, REGION V

Mr. Cas Stevens, Safety Director
Vernitron Piezoelectric Division
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146-5478

Mr. Stevens:

On December 15, 1986, Vernitron Piezoelectric Division submitted to Ohio EPA a closure plan for an indoor hazardous waste storage area and an outdoor hazardous waste drum storage area. These areas are located at 232 Forbes Road, Bedford, Ohio. Revisions to the closure plan were received on March 12, 1987. The closure plan was submitted pursuant to Rule 3745-66-12 of the Ohio Administrative Code (OAC) in order to demonstrate that Vernitron's proposal for closure complies with the requirements of OAC Rules 3745-66-11 and 3745-66-12.

The public was given the opportunity to submit written comments regarding the closure plan of Vernitron Piezoelectric in accordance with OAC Rule 3745-66-12. No comments were received by Ohio EPA in this matter.

Based upon review of the company's submittal and subsequent revisions, I conclude that the closure plan for the hazardous waste facility at Vernitron Piezoelectric meets the performance standard contained in OAC Rule 3745-66-11 and complies with the pertinent parts of OAC Rule 3745-66-12.

The closure plan submitted to Ohio EPA by Vernitron Piezoelectric is hereby approved with the following conditions:

1. The facility map received by the Ohio EPA Northeast District Office (NEDO), Division of Solid and Hazardous Waste Management (DSHWM), on March 12, 1987, shall be incorporated into the partial closure plan.

2. This closure plan approval shall address only the hazardous waste management units used by Vernitron Piezoelectric for the storage of hazardous wastes for greater than ninety (90) days.

3. The inside storage area to under go closure shall be defined as the shaded warehouse area of the facility's revised facility map; the outside storage area to under go closure shall be defined as the shaded area of the revised facility map designated "drum storage area" (revised facility map dated March 11, 1987).

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Marie Shadle Date 5-7-87

Ohio Environmental Protection Agency
ENTERED DIRECTOR'S JOURNAL
MAY - 7 1987

4. Vernitron Piezoelectric shall clean the paved surface of the outside storage area using the same method as that specified in the revised closure plan for the inside storage area. Liquid and solid residues collected from the cleaning of the inside and outside storage areas, if determined to be hazardous waste through analysis, shall be managed in accordance with state and federal hazardous waste regulations.

5. The paved surface of the outside storage area shall also be tested to confirm that cleaning activities have been adequate using the same method as that found in the revised closure plan for the inside storage area concrete. The inside and outside storage area surfaces shall be tested separately.

6. Vernitron Piezoelectric shall analyze storage area rinseate water samples for organic compounds using Methods 8010 and 8020 of USEPA Publication SW-846 (Test Methods for Evaluating Solid Waste, Physical/Chemical Methods) and for the eight (8) EP metals using the EP Toxicity Test Procedure (also found in USEPA Publication SW-846). Rinseate analysis results shall be reported to the appropriate Ohio EPA NEDO DSHWM personnel within ten (10) working days of their receipt by Vernitron Piezoelectric. No more than 1 mg/l of any RCRA-regulated solvent shall be detected in the water samples in order for the storage areas to be considered "clean." Additionally, metals values shall be less than their respective maximum concentrations for characteristics of EP Toxicity.

7. Vernitron Piezoelectric shall collect an additional soil core sample at a location at or near the southwest corner of the property fence, for a total of five (5) soil sampling locations and four (4) background sampling locations. The sampling device shall be decontaminated between each use by washing and then rinsing with deionized water. The five (5) soil samples shall be located as near to the perimeter fence as possible to detect any contamination from run-off from the storage area.

8. Samples collected at each of the five (5) soil sampling locations shall also be analyzed for organic compounds using SW-846 Method 8240. All compounds detectable by the method shall be analyzed for and reported, if found.

9. Total metals results from the analysis of the nine (9) soil sampling locations and organics results from the analysis of the five (5) soil sampling locations shall be submitted to the appropriate Ohio EPA NEDO DSHWM personnel within ten (10) working days of their receipt by Vernitron Piezoelectric. Vernitron Piezoelectric shall select from the attached, a means by which background and closure soil samples shall be compared to determine if soils in excavated areas are significantly contaminated with naturally occurring elements from past waste management practices. This material shall be submitted to the Ohio EPA, NEDO DSHWM within ten (10) working days of the receipt of this letter. If any RCRA-regulated organic compound is detected in the samples, the soil shall be considered contaminated. In the event that contamination is found, Vernitron Piezoelectric shall notify the appropriate Ohio EPA NEDO DSHWM personnel within ten (10) working days of the receipt of sample results by Vernitron Piezoelectric. Contaminated soil shall be removed and managed as hazardous waste.

Please be advised that approval of this closure plan does not release Vernitron Piezoelectric from any responsibilities as required under the Hazardous and Solid Waste Amendments of 1984 regarding corrective action for all releases of hazardous waste or constituents from any solid waste management unit, regardless of the time at which waste was placed in the unit.

Due to the fact that the Ohio EPA is not currently authorized to conduct the federal hazardous waste program in Ohio, your closure plan also must be reviewed and approved by USEPA. Federal RCRA closure regulations (40 CFR 265.112) require that you submit a closure plan to George Hamper, Chief, Waste Management Division, Technical Programs Section, Ohio Unit, USEPA, Region V, 5HS-13, 230 South Dearborn Street, Chicago, Illinois 60604. Approval by both agencies is necessary prior to commencement of activities required by the approved closure plan.

You are notified that this action of the Director is final and may be appealed to the Environmental Board of Review pursuant to Section 3745.04 of the Ohio Revised Code. The appeal must be in writing and set forth the action complained of and the grounds upon which the appeal is based. It must be filed with the Environmental Board of Review within thirty (30) days after notice of the Director's action. A copy of the appeal must be served on the Director of the Ohio Environmental Protection Agency and the Environmental Enforcement Section of the Office of the Attorney General within three (3) days of filing with the Board. An appeal may be filed with the Environmental Board of Review at the following address: Environmental Board of Review, 250 East Town Street, Room 101, Columbus, Ohio 43266-0557.

When closure is completed, the Ohio Administrative Code Rule 3745-66-15 requires the owner or operator of a facility to submit to the Director of the Ohio EPA certification by the owner or operator and a registered professional engineer that the facility has been closed in accordance with the approved closure plan. The certification by the owner or operator should include the statement found in OAC 3745-50-42(D). These certifications should be submitted to: Ohio Environmental Protection Agency, Division of Solid and Hazardous Waste Management, Attn: Thomas Crepeau, Program Planning and Management Section, P.O. Box 1049, Columbus, Ohio 43266-1049.

Warren W. Tyler

DF/ara

cc: Thomas Crepeau/Central File, Ohio EPA, DSHWM
George Hamper, USEPA, Region V
Rebecca Strom, USEPA, Region V
Debby Berg, Ohio EPA, NEDO

1370U

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Shadle Date 5-7-87

Ohio Environmental Protection Agency
ENTERED DIRECTOR'S JOURNAL

MAY -7 1987

ATTACHMENT

NATURALLY OCCURRING ELEMENTS OR COMPOUNDS

Alternative A - Soils containing naturally occurring elements in the area of the hazardous waste management unit shall be considered to be contaminated if concentrations in the soils exceed the mean of the background samples plus two standard deviations.

All metals analyses must be for total metals.

Alternative B - Soils containing RCRA-regulated metals shall be considered to be contaminated if concentrations in the soil exceed the upper limit of the range for Ohio farm soils, as given below:

Metal	Range (Total Metal Concentration in ug/g)
Cadmium	0 - 2.9
Chromium	4 - 23
Lead	9 - 39

(Source: Logan, T.J. and R.H. Miller, 1983. Background Levels of Heavy Metals in Ohio Farm Soils. Research Circular 275, Ohio State University, Ohio Agricultural Research and Development Center, Wooster.)

All metals analyses must be for total metals.

Ohio EPA may reject any of the above alternatives based on site-specific information. Also, the Agency may accept alternate statistical methods if the owner/operator can demonstrate that the statistical method proposed is environmentally acceptable and is technically superior.

1370U

OhioEPA
State of Ohio Environmental Protection Agency

P.O. Box 1049, 361 E. Broad Street
Columbus, Ohio 43266-1049
(614) 466-8565

Richard F. Celeste
Governor

March 6, 1987

Re: Vernitron Piezoelectric Division
US EPA ID No.: OHD052324290
Ohio Permit No.: 02-18-0649 LF
Closure Plan

RECEIVED
MAR 10 1987
SWD - MIS
U.S. EPA, REGION V

Vernitron Piezoelectric Division
Attn: Cas Stevens
232 Forbes Road
Bedford, Ohio 44146

Dear Sir:

A public notice acknowledging the Ohio EPA's receipt of a closure plan for Vernitron Piezoelectric in Bedford, Ohio will appear the week of March 15, 1987, in the Plain Dealer, Cleveland, Ohio. The Director of the Ohio EPA will act upon the closure plan request following the close of the public comment period, April 17, 1987.

Copies of the closure plan will be available for public review at the Cleveland Public Library, 325 Superior Avenue, Cleveland, Ohio 44114 and the Ohio EPA, Northeast District Office, 2110 E. Aurora Road, Twinsburg, Ohio 44087.

Please contact me at (614) 466-1578, if you have any questions concerning this matter.

Sincerely,

James F. Flautt

James F. Flautt
Data Management Unit
Program Planning and Management Section
Division of Solid & Hazardous Waste Management

JFF/dhs

cc: George Hamper, U.S. EPA, Region V
Rebecca Strom, U.S. EPA, Region V
Dan Fisher, Ohio EPA, DSHWM, TA&ES
Deborah Berg, Ohio EPA, DSHWM, NEDO

1013R

P 371 345 839

RECEIPT FOR CERTIFIED MAIL

NO INSURANCE COVERAGE PROVIDED—
NOT FOR INTERNATIONAL MAIL

(See Reverse)

Sent to OHD052324290 VERNITRON CORP	
Street and No. 232 FORBES	
P.O., State and ZIP Code BEDFORD OH 44146	
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to whom and Date Delivered	
Return Receipt Showing to whom, Date, and Address of Delivery	
TOTAL Postage and Fees	$
Postmark or Date	USPO SEP 30 1982

WMP

PS Form 3800, Feb. 1982

PS Form 3811, Dec. 1980

RETURN RECEIPT, REGISTERED, INSURED AND CERTIFIED MAIL

● SENDER: Complete items 1, 2, 3, and 4.
Add your address in the "RETURN TO" space on reverse.

(CONSULT POSTMASTER FOR FEES)

1. The following service is requested (check one).
- [x] Show to whom and date delivered .... ___¢
- [ ] Show to whom, date, and address of delivery.. ___¢

2. [ ] RESTRICTED DELIVERY ___¢
(*The restricted delivery fee is charged in addition to the return receipt fee.*)

TOTAL $ ____

3. ARTICLE ADDRESSED TO: OHD052324290
VERNITRON CORP
232 FORBES
BEDFORD, OH 44146

YB

4. TYPE OF SERVICE:
- [ ] REGISTERED
- [ ] INSURED
- [x] CERTIFIED
- [ ] COD
- [ ] EXPRESS MAIL

ARTICLE NUMBER
P23 6913273

(Always obtain signature of addressee or agent)

I have received the article described above.
SIGNATURE [ ] Addressee [ ] Authorized agent

5. DATE OF DELIVERY

POSTMARK
CLEVELAND, OH BEDFORD BR.
OCT 4 1982

6. ADDRESSEE'S ADDRESS (*Only if requested*)

7. UNABLE TO DELIVER BECAUSE:

7a. EMPLOYEE'S INITIALS

UNITED STATES POSTAL SERVICE
OFFICIAL BUSINESS

SENDER INSTRUCTIONS

Print your name, address, and ZIP Code in the space below.
- Complete items 1, 2, 3, and 4 on the reverse.
- Attach to front of article if space permits, otherwise affix to back of article.
- Endorse article "Return Receipt Requested" adjacent to number.

PENALTY FOR PRIVATE USE TO AVOID PAYMENT OF POSTAGE, $300

U.S. MAIL

CLEVELAND, OH BEDFORD BR.
OCT 4 1982
U.S.P.O.

RETURN TO

EPA RCRA FINANCIAL REQ.
(Name of Sender)

PO BOX A3587
(Street or P.O. Box)

CHICAGO IL 60690
(City, State, and ZIP Code)

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

REPLY TO ATTENTION OF:

5HW-TUB

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. C.G. Stevens
Vernitron Corporation
232 Forbes Rd.
Bedford, Ohio 44146

RE: Vernitron Corp.
OHD052324290

Dear Mr. Stevens:

The referenced company is a hazardous waste treatment, storage, or disposal facility subject to the Resource Conservation and Recovery Act (RCRA) as amended. Federal regulations (40 CFR Part 265 Subpart H) require that such facilities shall provide to the United States Environmental Protection Agency (U.S. EPA) proof of financial assurance for closure by July 6, 1982, and proof of liability coverage by July 15, 1982 (40 CFR 265.143 and 265.147 respectively).

To date U.S. EPA has not received these proofs; consequently, the facility is in violation of the requirements of 40 CFR Part 265 Subpart H. The Agency considers these financial responsibility proofs as significant requirements of the hazardous waste regulations. Failure to provide these required proofs within 30 days of receipt of this notice may subject the facility to enforcement action. RCRA provides for civil penalties up to $25,000 per violation. Please forward the financial responsibility proofs to:

RCRA Activities
ATTN: Financial requirements
P.O. Box A3587
Chicago, Il 60690

Mr. Thomas B. Golz, at (312) 886-4023, can provide additional information concerning this notice.

Sincerely,

William H. Miner

William H. Miner, Chief
Technical, Permits, and Compliance Section

cc: Tegtmeyer - OEPA

A.4.4

02-18-0649LF
OHD052324590

Vernitron Piezoelectric Division
232 Forbes Road / Bedford, Ohio 44146 / (216) 232-8600

December 12, 1986

Ms. Deborah Berg
District Supervisor
Ohio EPA
Northeast District Office
2110 E. Aurora Road
Twinsburg, OH 44087-1969

RECEIVED
OHIO EPA
DEC 16 1986
DIV. of SOLID & HAZ. WASTE MGT.

Dear Ms. Berg:

This letter is to advise you that the attached Vernitron Piezoelectric Division, Hazardous Waste Management Plan, revised December 10, 1986, is being submitted to satisfy the requirements of changing the hazardous waste permit status of Vernitron Piezoelectric Division to that of generator (see Closure Plan Hazardous Waste Storage). As you requested, two (2) copies of this plan are also being forwarded today to Mr. Tom Crepeau, Data and Permit Records, Division of Solid and Hazardous Waste Management, Ohio EPA, P.O. Box 1049, Columbus, Ohio.

The disposal of the "ten (10) drums", covered in your letter of August 21, 1986 is proceeding and is scheduled to be completed in accordance with the time availability of the disposal agent, Research Oil,1/9/87.

Thank you again for your advice and guidance in aiding us to insure that our division's hazardous waste material control program meets the Ohio EPA regulations and guidelines.

Sincerely,

Cas Stevens

Cas Stevens
Quality Control Manager

CS:dw

Enclosure: Vernitron Piezoelectric Division Hazardous Waste Management Plan, revised 12/10/86

Copies: (1) Ohio EPA Northeast District Office
(2) Mr. Tom Crepeau, Data and Permit Records, Division of Solid and Hazardous Waste Management, Ohio EPA, P. O. Box 1049, Columbus, Ohio 43266-0149

VERNITRON PIEZOELECTRIC DIVISION

HAZARDOUS WASTE MANAGEMENT PLAN

REVISED 12/10/86

Closure Plan

This document updates the Vernitron Piezoelectric Division hazardous waste management plan in accordance with current EPA and RCRA regulations. Included in this plan is a proceedure for a partial closing of the Hazardous Waste Storage areas which will change the permit status of the Vernitron Piezoelectric Division to that of generator. This plan will be reviewed annually for incorporation of division operating changes and EPA and RCRA regulation changes.

All inquiries regarding the information in this document should be directed to Cas Stevens, Vernitron Piezoeletric Division, 232 Forbes Road, Ohio 44146, (216)232-8600.

Vernitron Piezoelectric Division
232 Forbes Road / Bedford, Ohio 44146 / (216) 232-8600

December 12, 1986

Ms. Deborah Berg
District Supervisor
Ohio EPA
Northeast District Office
2110 E. Aurora Road
Twinsburg, OH 44087-1969

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Sincerely,

Cas Stevens

Cas Stevens
Quality Control Manager

CS:dw

Enclosure: Vernitron Piezoelectric Division Hazardous Waste Management Plan, revised 12/10/86

Copies: (1) Ohio EPA Northeast District Office
(2) Mr. Tom Crepeau, Data and Permit Records, Division of Solid and Hazardous Waste Management, Ohio EPA, P. O. Box 1049, Columbus, Ohio 43266-0149

Waste Analysis Plan

VERNITRON PIEZOELECTRIC WASTE ANALYSIS PLAN

SOLID HAZARDOUS WASTE

The primary activity at Vernitron Piezoelectric Division is the manufacture of Lead Zirconate Titanate (PZT) ceramics. PZT ceramics are a hard dense solid solution made from the processing of lead oxides, zirconium oxides, titanium oxides and minor additions of other inorganic oxides.

The raw oxides are tested prior to use primarily by spectrographic analysis utilizing a local commercial laboratory. The spectrographic analyses and periodic quantitative analyses provide us with an accurate determination of oxides purity and identification and level of impurities in these oxides.

The quality of the PZT ceramics is dictated by precise control of the compounding of the oxides requiring weighing accuarcies of .02 percent. All laboratory analyses and process compounding activities are documented for traceability of the compounding accuracy and impurity levels in the PZT ceramics.

The oxide testing and formulation records also give us a current measure of the materials in the solids waste stream. In addition to these records we have supplemented our waste stream analyses by having the solids waste analysed per EPA 40 CFR Part FRL 1014.5, Hazardous Waste Guidelines and Regulations, Federal Register, Volume 43, No.. 243, December 18, 1978. These analyses were performed by CWC Industries, Incorporated, Cleveland Ohio on material taken from the waste stream at the four main points the waste ceramic is generated. The results of all of the oxide laboratory analyses and waste stream analyses were then reviewed with respect to the material data sheets and EPA regulations on toxicity of hazardous material to determine the controls and permit requirements to be met to comply with the EPA and RCRA regulations for treatment, storage and disposition of hazardous materials.

The introduction of new materials into our manufacturing process is done under the direction of the Engineering Manager. All changes to our manufacturing process require the review and approval of the Quality Control Manager who is responsible for the testing and analysis of all materials used in our division. The Purchasing Agent must obtain current material data sheets on all material samples and materials ordered for our processes.

The Emergency Director, with the aid of the Medical Department, is responsible for evaluating the safety and health impact of all materials and the waste streams containing these materials on our employees and the environment.

New materials which impact on our waste stream control will be analysed in the manner described above for raw material oxides and waste stream analyses in accordance with current EPA and RCRA regulations.

The solid hazardous materials collected at Vernitron Piezoelectric are of two main types:

1. Fired PZT Ceramic - A hard dense material identified as Lead-Zirconate-Titanate (PZT). This material is sold to manufacturers of special metal alloys requiring lead. Some of the fired ceramic is coated with a fired silver compound and is sent to a precious metal salvage processor for reclaim of the silver in the compound.

2. Powder and Cake PZT Ceramic - A compact of lead oxide, zirconium oxide and titanium oxide plus partially reacted lead-zirconate-titanate (PZT) material. Also the grinding and cutting kerf of PZT ceramic bodies. These materials are also salable to specialty metal alloy manufacturers requiring lead in their products. However, recent re-evaluations of these materials has shown that we can recycle these materials in our current and future manufacturing process. (See memorandum <u>Waste PZT Meeting, September 29, 1984</u> attached)

LIQUID HAZARDOUS WASTE

The liquid hazardous wastes stored on site, at Vernitron Piezoelectric, are generated at Vernitron Piezoelectric. These wastes are primarily perchlorethylene, white mineral oil and toluene. These liquids are sent back to the suppliers for analysis and reclaim. The primary contaminant in the perchlorethylene is the white mineral oil. The main contaminant in the white mineral oil is carbon which results from the use of heated mineral oil as a processing bath in the treatment of fired lead-zirconate-titanate (PZT) ceramics. The main contaminant in the waste toluene is silver which is filtered for reclaim.

A secondary contaminant of the perchlorethylene is silver which is filtered out of the perchlorethylene. The silver is sent to a precious metal slavage processor for reclaim. The filtered perchlorethylene is then sent back to the supplier for analysis and reclaim. The liquid supplier is permitted for the storage and treatment of the perchlorethylene in accordance with current EPA regulations. All materials returned to the supplier are manifested in accordance with current EPA and RCRA regulations.

A-5-O

PIEZOELECTRIC DIVISION

INTER-OFFICE

TO R. Roch

DATE October 1, 1984

FROM C. Stevens

COPY TO G. Stephen
E. Abbott
W. Dorn
W. Hocevar
K. Kupcak
K. Boron

SUBJECT Waste PZT Meeting Septmeber 29, 1984

On September 29, 1984 a meeting was held to review EPA permit requirements to store and dispose of hazardous solid materials. This memo is to summarize action to be taken to reduce the amount of PZT that is considered a hazardous waste that must have an EPA permit for storage and disposition. In keeping with the letter and intent of the RCRA regulations we have determined that we can recycle Lead Zirconate Titanate (PZT) compounds collected from our wet scrubber and Spencer systems.

The PZT compounds collected from the wet scrubbers will be dewatered and mixed with either Rhoplex or PVA binders. The PZT compounds mixed with Rhoplex binder will be formed into thinsheet to provide atmosphere in the periodic kilns and atmosphere carriers in the belt kilns. The PZT compounds mixed with PVA binder will be formed into setter plates for use in the periodic kilns.

The PZT compounds collected from the Spencer (dry) collector will be mixed with binders as above for use as atmosphere, atmosphere carriers and setters.

This recycling of PZT compounds collected in the wet scrubbers and Spencer will allow us to reduce the use of good inventory PZT ceramic powder for these inprocess requirements. We should see a cost reduction in the powder preparation cost center as a result of this recycling operation.

In order to put this recycling operation into effect we will immediately start saving the PZT compounds collected in the wet scrubbers and Spencer in drums. We will then determine the collected weights daily, and inventory the material until we accumulate a batch large enough to process through binder addition and spray drying, approximately 1000 lbs. The spray dryed material will then be given a unique lot designation for inventory purposes and forming purposes.

A daily log sheet of collected PZT compounds will be posted by the powder preparation area supervisor.

Date	Dry Collected PZT wt. in Lbs.			Powder prep area Production activity
	Scrubber #1	Scrubber #2(S.D.)	Spencer	

We will use data from the log sheet to determine our collection and processing schedule of the recycled PZT compounds.

Cas Stevens

Cas Stevens

CWC INDUSTRIES, INCORPORATED
ENVIRONMENTAL ENGINEERING - AIR, WATER AND WASTE
2750 GRAND AVENUE • CLEVELAND, OHIO 44104 • 216-721-4747

COPIES: MR. CASSTEVENS

LAB. NO. 10745
Please refer to Above Lab. No. When Corresponding.

NAME VERNITRON PIEZOELECTRIC DIVISION SAMPLE DATE REC'D. 2-14-79
ADDRESS 232 FORBES ROAD, BEDFORD, OHIO #44146
REPORT COVERING TOXIC WASTES

SAMPLES FOR TESTING FOR LEAD PER EPA 40 CFR PART 250 FRL 1014.5 HAZARDOUS WASTE GUIDELINES AND REGULATIONS, FEDERAL REGISTER, VOLUME 43, NO. 243, DECEMBER 18, 1978.

LABORATORY NUMBER	SAMPLE	RESULTS, MG/L LEAD IN EXTRACT
10745-1	LATHE SCRAP	71
10745-2	BISQUE FIRE SCRAP	8.6
10745-3	HIGH FIRE/MACHINE SCRAP	2.9
10745-4	ROTOCLONE SLUDGE	70

THE MAXIMUM ALLOWABLE LEAD IN EXTRACT IS 0.5 MG/L.

Mike Schack
MIKE SCHACK

Copies to M Riggman
K Kipone

Inspection Plan

VERNITRON PIEZOELECTRIC WASTE INSPECTION SCHEDULE

INSPECTION DESCRIPTION	INSPEC. FREQ.	LOCATION	EQUIPMENT	ACCEPTABLE CONDITION CRITERIA	DATE CONDITION	INSPECTED BY ACTION REQ'D	DATE CONDITION	INSPECTED BY ACTION REQ'D	DATE CONDITION	INSPECTED BY ACTION REQ'D
1. Drums of PZT CERAMIC	Weekly	Storage Area "A"	Fibre drums	Closed, tagged with descriptions, weight. No holes, no sign of leakage. Inventory accurate. Labeled hazardous waste & accumulation start date.						
2. Drums of PZT ceramic with silver	Weekly	Storage Area "B"	Fibre drums	Closed, tagged with descriptions, weight. No signs of leaks. Inventory accurate. Labeled hazardous waste and accumulation start date.						
2a. Drums of silver in perchlorethylene	Weekly	Storage Area "B"	Drums-lined							
2b. Drums of silver in toluol	Weekly	Storage Area "B"	Drums-lined							
3. Collection sumps	Weekly	Powder prep	Sumps w/grates	Not overfilled, floor area at grates clean. Sumps identified contain H. freeboard of two feet						
3a. Sumps for waste	Every 89 days	Mach. areas Powder prep								
4. Vacuum sump pump	Weekly	Powder prep	Vacuum tank	Empty, clean, no sign of leaks.						
5. Perchlorethylene used	Weekly	Warehouse	Drums	Closed, tagged. No sign of leaks. Inventory accurate. Labeled Hazardous Waste with accumulation start date.						
5a. Perchlorethylene used	Weekly	Outside	Drums							
6. Freon used storage	Weekly	Warehouse	Drums	As above						
6a. Freon used storage	Weekly	Outside	Drums	As above						
7. Toluene used storage	Weekly	Warehouse	Drums	Closed, tagged. No sign of leaks. Inventory accurate Labeled Hazardous Waste w/ accumulation start date.						
7a. Toluene used storage	Weekly	Outside	Drums							
8. Mineral oil used	Weekly	Warehouse	Drums	Closed, tagged with description, weight. No signs of leaks. Inventory accurate. Labeled Hazardous Waste with accumulated start date.						
8a. Scrap oil used	Weekly	Outside	Drums							
9. Absorbent inert material-spill control.	Weekly	Warehouse	Inert material	Unused, dry in open marked containers.						
10. Steel & fibre drums, lids & lock rings	Weekly	Warehouse	Drums	Clean, empty, good condition, no evidence of leaks.						
11. Fire extinguisher inspection & emergency lighting	Monthly	Per Map	Fire Exting.	Charged, use seal intact batteries & chg. system operative						
12. Sprinkler system	180 days	West & East Stand pipe	Honeywell signal Water mechanical alarm	Honeywell Protection Service Inspection						
13. Alarm system	180 days	Poling area Receptionist	Audible alarm Battery backup	Operative, battery & charge system						
14. Mobile radios	Monthly	Staff offices	3 Channel CB	Batteries charged, operative						

Management of Regulated Wastes

All hazardous wastes will be stored in containers suitable for protection against leakage and appropriate of transportation to recyclers, salvagers and customers incorporating these materials into their manufacturing processes. Manifesting of all hazardous materials will be performed as required by current EPA and RCRA regulations.

Hazardous waste will be recycled, salvaged or sold within the 90 day hold period based on date produced.

All containers used to temporarily accumulate hazardous wastes are to be labeled with hazardous wastes labels identifying the hazardous material and date of start of accumulation.

Regular inspections shall be performed of containers containing hazardous wastes, emergency equipment, fire and spill control equipment and communication equipment in accordance with the Vernitron Piezoelectric Waste Inspection Schedule.

VERNITRON PIEZOELECTRIC DIVISION INSPECTION OF SAFETY, FIRE AND SPILL PREVENTION EQUIPMENT

SAFETY INSPECTION PLAN

The Emergency Director is responsible for the maintenance of an active Safety Committee comprised of the plant nurse, representing management, and two or three hourly union employees. This committee meets monthly to review discovered and potenial safety violations. A report on all activities of this committee is made to the General Manager and the Emergency Director.

All accidents involving personal injury, equipment damage, chemicals, hazardous materials, and hazardous wastes are reported by the Supervisor responsible for the employees and areas involved. The accidents are investigated by the Supervisor, Medical Department and Emergency Director to determine the cause of the accident, to determine action taken to handle the accident and to determine the corrective action to be implemented to prevent recurrence of the accident.

FIRE EQUIPMENT INSPECTION PLAN

Sprinkler Sustem - A sprinkler system is in place for all storage areas containing combustible materials and as required to protect combustible portions of the building structure. The sprinkler system is connected by telephone to Honeywwell Protection Service which notifies the local Fire Department of the sprinkler system activation. In addition, there are two mechenical water-flow detection alarms to announce the sprinkler system activation. The sprinkler system alarms are inspected by Honeywell Protection Service quarterly.

Fire Extinguishers - Fire extinguishers, chemical and carbon dioxide, are distributed throughout our building. These extinguishers are inspected monthly by the Maintenance Department and yearly by an outside fire extinguisher service company. A map of the fire extinguisher locations is maintined in the Maintenance Department. The Maintenance

Department is also responsible for recharging extinguishers that are discharged or found to fail the monthly inspection.

Inspections by Outside Services - The local Fire Department and our property insurance agency have trained representatives inspect our facility for fire hazards and safety hazards at a minimum annually.

OTHER EMERGENCY EQUIPMENT

There is an emergency lighting system distributed throughout our building that is activated automatically in the event of a power failure. This lighting system is inspected quarterly by the Maintenance Department. In addition our public address system has provisions for an emergency alarm signal which can be activated at two locations inf the building. The public address system will also operate for approximately 45 minutes on its own battery system which is activated automatically in the event of an electrical power outage. This system is inspected bi-weekly by our electronic calibration technician.

Emergency communications within the building and outside the building are available through the use of mobile multichannel transceivers distributed to key personnel. The transceivers are inspected bi-weekly by our electronic calibration technician.

SPILL CONTROL EQUIPMENT

Absorbent inert materials are located in those areas where waste hazardous liquids are stored. Steel drums with steel lids and locking rings are also located in these storage areas for containment of absorded spills for controlled treatment and controlled disposition. These materials are inspected weekly.

A high vacuum sweeper equipped with high efficiency filters is available for containment of dry hazardous waste materials and dry hazardous materials spills and is inspected weekly.

MGMT Training

VERNITRON PIEZOELECTRIC DIVISION WASTE MANAGEMENT TRAINING PROGRAM

Vernitron Piezoelectric Division will maintain a waste management training program for all personnel directly involved in the processing and control of hazardous waste materials and the supervision of employees processing hazardous waste materials. The Emergency Director has the responsibility for maintaining, documenting and implementing the training program.

The training program will consist of both audio-visual presentations and lectures on safe handling of hazardous materials and on-the-job training involving the use of waste handling and storage eequipment. Lectures will be given by individuals trained in the subjects presented. The training of personnel will be completed within six months of employment or assignment to waste handling duties and will be repeated at a minimum annually.

The Emergency Director is responsible for the reporting of all waste handling training to the Personnel Department for maintenance of a permanent record of the training activities. The training will be performed by management personnel and consultants trained in hazardous material control and emergency procedures at Vernitron Piezoelectric Division.

The hazardous waste management training program consists of:

1. Review and discussion ot the Vernitron Piezoelectric Emergency Plan.
2. Lecture and demonstration of the use of employee protection equipment including respirator use and an audio-visual program.
3. Lecture on personal hygiene procedures for working with hazardous materials, including an audio visual program.
4. Lecture and demonstrations of techniques for monitoring employee exposure to hazardous materials.
5. Hands-on-training in the use of handling and processinng equipment for control and containment of spills of hazaradous materials and hazardous waste materials.
6. Training in proper identification, labeling, inventorying and storage of hazardous waste

materials.

7. Training in the requirements for regular inspection and doumentation of the inspections of equipment and storage facilities for controlling hazardous waste materials.

8. Training in the correct response to emergency situations.

The employees directly involved in the control of hazardous waste materials are:

1. Supervisor of Powder Preparation Area is responsible for direction of employees involved in storage, compounding and forming of all products generating solid waste materials. Waste materials treated and stored in the area under his supervision are powder and cake PZT ceramic, pemitted and unpermitted, and storage of hazardous liquid wastes (perchlorethylene and white mineral oil). He is responsible for inventorying these materials.

2. Supervisors of Firing, Machining, Electroding, Poling Areas are responsible for directing employees involved in processes generating solid and liquid hazardous wastes. Waste materials collected in the areas under their supervision are fired PZT ceramics and hazardous liquid material including perchlorethylene, white mineral oil and toluene.

3. Supervisor of Maintenance is responsible for directing the activities of the Custodian and Maintnance Persons involved in the cleaning and repair of equipment used in the control of hazardous waste materials. He is responsible for directing the Custodian in the collection and container identification of waste fired PZT, powder PZT and cake PZT ceramics and liquid wastes including perchlorethyene, white mineral oil and toluene. He also directs the Maintenance Persons in the servicing and repair of equipment used in treating and storing hazardous waste solids. He is also responsible for on-the-job training and direction of the Custodian and Maintenance Persons in the containment and clean-up of spills of hazardous materials and hazardous waste materials both solid and liquid.

4. Purchasing Agent is responsible for directing the inventorying, storage, manifesting and transportaion of hazardous waste materials for recycling and salvage.

5. Custodian - perform routine building and ground maintenance duties. (see listing of duties as outlined in the Union Agreement attached)

Hazardous waste duties of the Custodian include emptying of sumps containing PZT powder from the collection scrubbers and process equipment cleaning; emptying the dry vacuum collector of PZT powders; collect fired PZT ceramic, weigh, label and seal drums for storage; collect waste perchlorethylene, waste white mineral oil and waste toluene for storage for recycling; contain and clean up spills of PZT powders, perchlorethylene, white mineral oil and toluene under the direction of the area supervisors and the Emergency Director.

6. Maintenance Person-perform various maintenance duties on a routine basis, involving building, utilities, equipment or machinery. (see listing of duties as outlined in the Union Agreement attached)

Hazardous waste duties of the Maintenance Persons include repair of equipment used to collect and process PZT powder; inspect and repair collection storage sumps; aid in the containment and cleanup of spills of hazardous waste solid and liquid materials under the direction of area supervisors and the Emergency Director.

7. Shipping, Receiving, Inventory Expediting and Stockroom Attendent - Receive incoming parts and other deliveries and maintain stockroom. (see listing of duties as outlined in the Union Agreement attached)

Hazardous waste duties include aiding in the inventorying, manifesting and shipping of hazardous waste materials under the direction of the Purchasing Agent.

CUSTODIAN

Perform routine building and ground maintenance duties.

1. Remove scrap paper and waste.

2. Clean drinking fountains, washrooms. Maintain cleanliness of building and grounds. Keep parking lot free of debris.

3. Replenish cleaning and washroom supplies.

4. Shovel snow, salt icy areas. Sidewalks only.

5. Cut grass and perform simple gardening duties.

6. Move furniture - office equipment.

7. Perform minor repetitive functions such as: cleaning filters, cleaning and refilling coolant tanks.

8. Operate powered lift truck and hand truck to move supplies and materials.

9. Replace light bulbs that can be reached using a six (6) foot stepladder.

MAINTENANCE PERSON

Perform various maintenance duties on a scheduled or non-routine basis, involving building, utilities, equipment or machinery.

Depending upon skill and knowledge, may work with little specific direction, planning own jobs, and carrying through to completion. May assist or train others.

For seniority purposes, maintenance people will be considered in separate classifications based on skills required for continuous operation of the plant.

Millwright: Move machinery; lay out location of machinery from print or oral description; lag or mount machinery as required; repair or replace belts; align motor couplings and shafts.

Painting: Hand brush; roller or spray paint interior or exterior of plant, fences, parking area and machinery; prepare surface as required including scraping, steam cleaning and washing. Keep adjacent areas clean; mix tint and thin paints as required for method of application; clean and care for equipment used in painting.

Masonry: Repair masonry walls and floors; cut hole in walls or floors for machinery or for clearance. Repair as required; install foundations, curbs or ramps as required; repair or replace burner blocks in gas fired kilns and furnaces; make repairs to brickwork in gas or electric kilns and furnaces.

Carpentry: Construct boxes, crates and skids for shipping or storing machinery and equipment; repair wooden parts of buildings, such as doors, window frames, walls and roofs; construct wood walls, shelves and supports as required; construct and repair wood fixtures as required by production departments, construct temporary shoring and covers as required for repair of equipment and buildings.

Sheet Metal: Construct guards for machinery and equipment; construct and repair fixtures as required by production departments; construct, install and repair ducts, hoods and vents.

Welding and Brazing: Gas braze and silver solder broken machinery and fixture parts; gas weld broken machinery parts, production fixtures; electric weld or braze for repair of machinery parts, production fixtures or construction.

Pipefitting and Plumbing: Repair faucets and valves; install and repair sinks, wash basins and foundations; install and repair water, air, gas, and vacuum lines using plastic or metal; install, clean and repair sewer lines; operate, clean and repair boilers and hot water tanks; operate, clean and repair water towers.

Machine Repair: Repair or replace broken or worn machines or fixture parts; make necessary adjustments to obtain optimum performance; perform special maintenance assignments such as starting up plant central facilities and assist in fire sprinkler inspection.

Electrical: Construct, install and maintain wiring and circuitry for machinery and building; install light fixtures; construct and repair electrical heating elements; install and maintain air conditioning systems and controls.

Tool Maintenance: Sharpen cutters, saws, drills, tool bits and other cutting tools as required by Maintenance and Production.

Machinist: Construct or repair production jigs, fixtures and tooling; construct or repair parts for machines and equipment.

SHIPPING, RECEIVING, INVENTORY

EXPEDITING & STOCKROOM ATTENDANT

Receive incoming parts and other deliveries and maintain stockroom. Working from production schedules, bills of materials and inventory records, keep production areas supplied with parts and materials.

1. Ship and receive parts, materials and other deliveries, open and verify contents, route to proper destination.

2. Store, maintain and issue stock, by requisition or request in stock areas.

3. Perform expediting of parts and material to work areas, including: make periodic check at work areas, withdraw and delivery required parts and materials.

4. Make necessary entries on travelers, stock tickets and other related records.

5. Notify Supervisor of shortages and other variations from scheduled routings.

6. Maintain fired stock storage.

7. Operate station wagon or light pickup vehicle to pick up our delivery production materials or parts when time or need for special delivery precludes the use of common

Personnel directly responsible for Safety, Emergency, Hazardous Waste Management:

1. Ronald Roch - General Manager of Vernitron Piezoelectric Division, responsible for the administration of all activities at VPD. Appoints the Safety Director.

2. Cas Stevens - Quality Control Manager and Manager of Special Projects. Safety Director responsible for administrating the management of safety, hazardous waste control, and training of safety and waste control procedures. Directs activities of all inspectors, purchasing, shipping and receiving.

3. Gary Stephen - Division Controller, head of Fire Squad.

4. Ed Abbott - Division Manufacturing Manager, alternate Safety Director, directs manufacturing supervisors, hourly employees, all shifts, and Medical Department.

5. Ken Kupcak - Purchasing Agent, supervises shipping, receiving and packing personnel. Responsible of inventory control, inspection and manifesting of all hazardous waste materials. Heads Evacuation Team.

6. William Hocevar - Engineering Manager, heads Rescue Team.

7. Dr. A. Rollins - Directs Medical Department, part time at facility, on call for all emergencies.

8. Karen Boron, R.N. - heads Dispensary, part time, represents Medical Department in Safety Committee, on call for all emergencies.

9. Walt Buczak - Supervisor Powder Preparation Area (see above).

10. Charles Kulchock - Supervisor Firing, Machining, Electroding (see above).

11. Ed Tomko - Supervisor Maintenance (see above), heads Salvage Department.

12. Richard Tegowski - Second Shift Supervisor and Second Shift Emergency Coordinator.

13. Bernie Schmidt - Furnace Tender Third Shift, Member of Safety Committee and Third Shift Emergency Coordinator.

14. Ed Lydon - Maintenance Person, member of Safety Committee (see above).

15. Chester Beal - Maintenance Person. (See above).

16. Mary Ahrens - Shipping, Receiving, Inventory Expediting, and Stockroom Attendant, (see above), Member of Safety Committee.

All of the above-mentioned personnel have received training in safety practices with regard to our primary hazardous material ---- lead. An annual review is scheduled for May 1985.

Training sessions on hazardous waste control are scheduled for the month of June and will be reviewed on an annual basis.

Specific training in hazardous material handling, fire fighting and first aid will be scheduled on a bi-monthly basis utilizing VCR tapes and lectures.

Emergency procedures will be reviewed during the week of May 13, 1985 and at a minumum of six month intervals thereafter.

Closure Plans
Facility & Storage

VERNITRON PIEZOELECTRIC DIVISION HAZARDOUS WASTE CLOSURE PLAN - FACILITY

This plan details the proceedures to be followed and an estimate of the probable costs to decontaminate the facility and dispose of the hazardous waste materials collected and stored at the Vernitron Piezoelectric Division, 232 Forbes Road, Bedford, Ohio 44146, Cuyahoga County. There are no plans under consideration for the closing down of the manufacturing operations at this facility. In the event that at some future date the decision is reached to close operations at this facility, the cognizant EPA office will be notified of the closure at least 180 days prior to the closing in order that approval be received for the closure plan.

All of the hazardous waste stored at Vernitron Piezoelectric Division is generated at this facility and is stored in either tanks within our building or within steel drums stored within our building and in steel drums stored within our asphalt paved wire fence enclosed parking area.

Our treatment of hazardous wastes involves only the dewatering of wastes within our building.

Our hazardous wastes are then either sold to specialty metal alloy producers, precious metal refiners or to suppliers for recycling.

The estimate of the costs are listed below to decontaminate this facility and dispose of stored and generated hazardsous wastes.

CLOSURE PLAN

Personnel involved in the removal of hazardous wastes will be under the direction of the Emergency Director to insure that all necessary precautions are taken to insure the workers health and safety and the protection of the surrounding environment. All employees will be supplied with equipment to safeguard their health and safety including protective clothing and shower facilities.

All hazardous wastes are to be identified and placed in approved containers, properly labeled for transportation to approved disposal facilities. All records concerning the transportation and disposal of hazardous wastes shall be completed, distributed and stored in accordance with current EPA and RCRA regulations.

All hazardous process wastes and decontamination wastes shall be treated, stored and disposed of in accordance with current EPA and RCRA regulations.

All process equipment shall be vacuum cleaned with an approved high-efficiency vacuum cleaner and then washed with water and commercial cleaners. All solids and liquids resulting from the cleaning will be accumulated, dewatered and treated as hazardous waste materials.

The process work and storage areas (powder preparation, warehouse, firing, grinding) shall be vacuum cleaned using high-efficiency filtered equipment and then washed with water and commercial cleaners. All solids and liquids resulting from the cleaning will be accumulated, dewatered and treated as hazardous waste materials.

The cleaned process equipment and process areas will be inspected by the taking and quantitative analysis of wipe samples of all surfaces. Review of the analyses of the wipe samples will be used to determine the effectiveness of the decontamination of the equipment and areas. The analyses shall be in accordance with current EPA and RCRA regulations.

SCHEDULE OF FACILITY CLOSURE OPERATIONS

Closure Date: There is no scheduled date of closure of this facility. The life of this facility is subject to the continuation of manufacturing piezoelectric ceramics as controlled by market and economic conditions.

Training of Closure Personnel: After receipt of the Closure Plan approval, personnel doing the decontamination and treatment of hazaradous waste materials will receive training in proper and safe techiques to decontaminate, treat and prepare hazardous waste materials for disposition. Time required for training estimated at two days.

Collection of Process Wastes: Collection and treatment of process wastes, identification and preparation for disposal estimated to take one week.

Decontamination of Process Equipment and Process Areas: Vacuuming and washing and treatment of collected solids and liquids for disposition estimated to take four weeks.

Testing of Decontaminated Equipment and Areas: Taking wipe samples and analyses of samples estimated to take three weeks.

POST CLOSURE PLAN

In the event of closure of this facility, all hazardous wastes shall be removed from this facility. Therefore, no post closure activities and costs are required or planned.

ESTIMATE OF INVENTORY OF HAZARDOUS WASTE AT CLOSURE AND COST OF DISPOSALFOR A FACILITY CLOSURE ONLY

Waste Description	Process Description	Quantity	Unit of Measure	Disposal Closure Cost
D008	S01	100000	P	$ [redacted]
D011	S01	100	P	$ [redacted]
D005	S01	60	P	$ *
D007	S01	20	P	$ *
F001	S01	12000	P	$ [redacted]
F005	S01	2100	P	$ [redacted]
				$ [redacted]

*Costs included in D008 Cost

Cost of Disposal of Process Hazardous Wastes	$ [redacted]
Cost of Cleaning Processing Areas-Powder Preparation, Warehouse, Firing and Grinding	$ [redacted]
Cost of Decontaminating Tanks, Sumps, Drums and Disposal of Hazardous Materials	$ [redacted]
Special Rental Equipment for Closure Operations	$ [redacted]
Total Estimated Cost of Closure	$ [redacted]

VERNITRON CORPORATION
2001 MARCUS AVENUE, LAKE SUCCESS, NY 11042 □ (516) 775-8200 □ TWX 510 223 0409

LEGAL DEPARTMENT

REF: GR-53 May 6, 1986

VIA FEDERAL EXPRESS

State of Ohio
Environmental Protection Agency
361 E. Broad Street
Columbus, Ohio 43216-1049

Attention: Ms. Deborah L. Tegtmeyer
Surveillance & Enforcement Section
Division of Solid & Hazardous Waste Management

RE: Financial Test Demonstration
for Closure and/or Post-Closure Care

Vernitron Piezoelectric Division Of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146

Corporate Office: Vernitron Corporation
2001 Marcus Avenue
Lake Success, New York 11042

EPA I.D. No.: OHD052324290
Ohio Permit No.: Not Applicable

Dear Ms. Tegtmeyer:

I am writing on behalf of our Piezoelectric Division, as referenced above:

In accordance with your request for an updated financial test demonstration, enclosed please find the following documentation required by Rule 3745-55-51 of the Ohio Administrative Code:

1. Letter dated May 2, 1986 from the Chief Financial Officer of Vernitron Corporation;

2. Special Report of Vernitron's independent certified public accountants, dated May 5, 1986; and

3. Form 10-K Annual Report of Vernitron Corporation for 1985. Unfortunately, our Annual Report to Shareholders is not yet available; however, a copy will be forwarded to you upon receipt.

As I indicated to you in our telephone conversation on Tuesday, April 29, your recent correspondence was unfortunately misaddressed to a former executive officer of the New York corporate headquarters, and then was mailed to our Piezoelectric Division in Bedford, Ohio. Please correct your records so that all future mailings are forwarded to my attention at the above address which will ensure a timely reply. I regret any inconvenience this delay may have caused, and appreciate the extension you have granted.

Should you have any questions, or require clarification of any information provided, please feel free to call me at (516) 775-8200, Ext. 23.

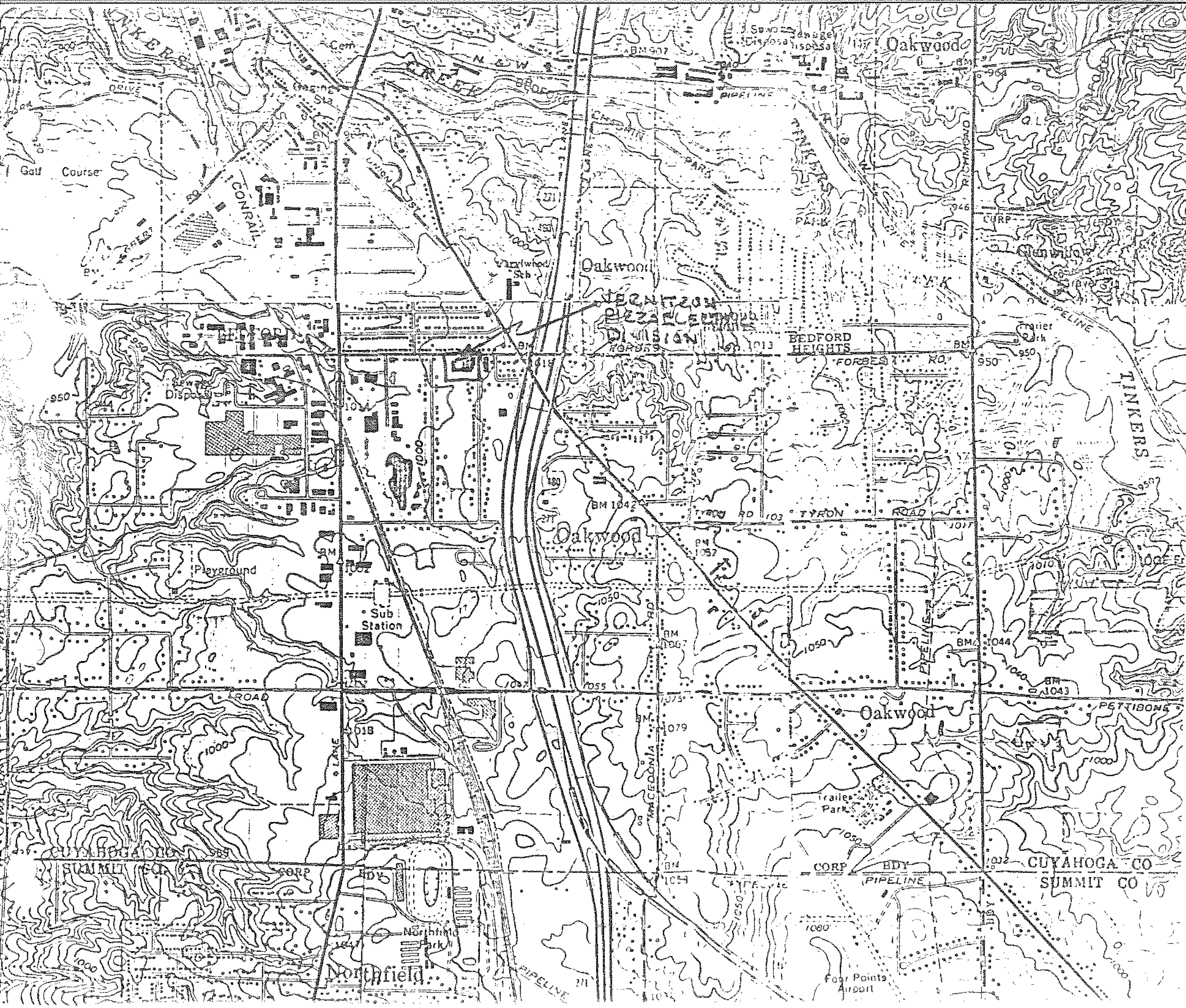
Very truly yours,

Pat Martel

Pat Martel
Environmental Compliance Manager

PM/sl
Enclosures

cc: L. J. Schwartz, Esq.
M. Goldman
R. Roch
C. Stevens
I. Lamel



0HD052324240

LOCATION MAP
VERNITRON PIEZOELECTRIC DIVISION
BEDFORD, OHIO

SCALE 1:24000

COMPOSITE FROM USGS QUADS
NORTHFIELD, OHIO
SHAKER HEIGHTS, OHIO
CHAGRIN FALLS, OHIO
TWINSBURG, OHIO

UTM GRID AND 1979 MAGNETIC NORTH
DECLINATION AT BOTTOM OF SHEET

VERNITRON CORPORATION
2001 MARCUS AVENUE, LAKE SUCCESS, NY 11042 □ (516) 775-8200 □ TWX 510 223 0409

EXECUTIVE OFFICES

RE: GR-53 May 2, 1986

Surveillance & Enforcement Section
Division of Solid & Hazardous Waste Management
State of Ohio Environmental Protection Agency
P.O. Box 1049
361 E. Broad Street
Columbus, Ohio 43216-1049

Attention: Ms. Deborah L. Tegtmeyer

RE: Financial Test Demonstration
for Closure and/or Post-Closure Care

Vernitron Piezoelectric Division Of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146

Corporate Office: Vernitron Corporation
2001 Marcus Avenue
Lake Success, New York 11042

EPA I.D. No.: OHD052324290 Ohio Permit No.: Not Applicable

Dear Ms. Tegtmeyer:

I am the Chief Financial Officer of the Vernitron Piezoelectric Division of Vernitron Corporation, located at 232 Forbes Road, Bedford, Ohio 44146. This letter is in support of the use of the financial test to demonstrate financial assurance as specified in Chapters 3745-55 and 3745-66 of the Administrative Code.

VERNITRON CORPORATION

1. This firm is the owner or operator of the following facility for which financial assurance for closure or post-closure is demonstrated through the financial test specified in Chapters 3745-55 or 3745-66 of the Administrative Code. The current closure and/or post-closure cost estimates covered by the test are shown for such facility:

Vernitron Piezoelectric Division of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146

EPA I.D. No.:	OHD052324290
Ohio Permit No.:	Not Applicable
Current Closure Cost Estimate:	$[redacted]
Current Post-Closure Cost Estimate:	Not Applicable

2. This firm guarantees, through the corporate guarantee specified in Chapters 3744-55 and 3745-66 of the Administrative Code, the closure and post-closure care of the following facilities owned or operated by subsidiaries of this firm. The current cost estimates for the closure or post-closure care so guaranteed are shown for each facility:

NONE

3. In states where the U.S. EPA or a state so authorized is administering the financial requirements of Subpart H of 40 CFR Parts 264 or 265, this firm, as owner or operator or Guarantor, is demonstrating financial assurance for the closure or post-closure care of the following facilities through the use of a test equivalent or substantially equivalent to the financial test specified in Chapters 3745-55 and 3745-66 of the Administrative Code. The current closure and/or post-closure cost estimates covered by such a test are shown for each facility:

NONE

4. This firm is the owner or operator of the following hazardous waste management facilities for which financial assurance for closure or, if a disposal facility, post-closure care, is not demonstrated to the Ohio EPA through the financial test or any other financial assurance mechanism specified in Chapters 3745-55 or 3745-66 of the Administrative Code, or equivalent or substantially equivalent state mechanisms. The current closure and/or post-closure cost estimates not covered by such financial assurance are shown for each facility:

NONE

This firm is required to file a Form 10-K with the Securities and Exchange Commission (SEC) for the latest fiscal year.

The fiscal year of this firm ends on December 27, 1986. The figures for the following items marked with an asterisk are derived from this firm's independently audited, year-end financial statements for the latest completed fiscal year ended December 28, 1985.

VERNITRON CORPORATION

ALTERNATIVE I

1. Sum of current closure and post-closure cost estimates (total of all cost estimates shown in the four paragraphs above....................$ 124,800.00

*2. Total liabilities (if any portion of the closure or post-closure cost estimates is included in total liabilities, you may deduct the amount of that portion from this line and add that amount to lines 3 and 4.................................54,818,000.00

3. Tangible Net Worth.................................63,601,000.00

*4. Net Worth.................................68,434,000.00

*5. Current Assets.................................78,048,000.00

*6. Current Liabilities.................................26,057,000.00

*7. Net Working Capital (line 5 minus line 6) 51,991,000.00

*8. The sum of net income plus depreciation, amortization.................................1,081,000.00

*9. Total assets in United States (required only if less than 90% of assets are located in the United States).................................Not Applicable

		Yes	No
10.	Is line 3 at least 10 million?.....................	X	
11.	Is line 3 at least 6 times line 1?..................	X	
12.	Is line 7 at least 6 times line 1?..................	X	
*13.	Are at least 90% of the firm's assets located in the U.S.? If not, complete line 14..............	X	
14.	Is line 9 at least 6 times line 1?........................	N/A	
15.	Is line 2 divided by line 4 less than 2.0?..........	X	
16.	Is line 8 divided by line 2 greater than 0.1?..................		X
17.	Is line 5 divided by line 6 greater than 1.5?.......	X	

I hereby certify that the wording of this letter is identical to the wording specified in paragraph (F) of Rule 3745-55-51 of the Administrative Code as such regulations were constituted on the date shown immediately below.

Very truly yours,

VERNITRON CORPORATION

By Michael J. Goldman

Michael J. Goldman,
Chief Financial Officer
Dated: May 2, 1986

LJS/sl

Ernst & Whinney

153 East 53rd Street
New York, New York 10022

212/888-9100

May 5, 1986

Mr. Michael Goldman
Chief Financial Officer
Vernitron Corporation
2001 Marcus Avenue
Lake Success, New York 11042

Dear Mr. Goldman:

At your request, we have read your letter to the State of Ohio Environmental Protection Agency, dated May 2, 1986, and compared the data in such letter which you have specified as derived from the consolidated financial statements of Vernitron Corporation and subsidiaries ("Vernitron") as of December 28, 1985 and for the year then ended, with related amounts in such financial statements. In connection with the procedure referred to above, no matters came to our attention that caused us to believe that the specified data should be adjusted. Because the above procedure does not constitute an examination made in accordance with generally accepted auditing standards, we do not express an opinion on the specified data mentioned above; however, we previously made an examination of Vernitron's consolidated financial statements in accordance with generally accepted auditing standards and, in our report dated April 11, 1986, expressed an unqualified opinion on Vernitron's consolidated financial statements as of and for the year ended December 28, 1985 from which the specified data was derived.

The aforementioned procedure was performed solely to assist you in complying with the regulations of the Ohio Environmental Protection Agency, and this report is not to be used for any other purpose.

Ernst & Whinney

FORM 1 GENERAL

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

F | O HD 0 52 3 24 2 90 | | D

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

VERNITRON
NOV 26 1982
RECEIVED

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill–in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill–in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold–faced terms.

SPECIFIC QUESTIONS	YES	NO	FORM ATTACHED
A. Is this facility a **publicly owned treatment works** which results in a **discharge** to **waters of the U.S.**? (FORM 2A)		X	
B. Does or will this facility *(either existing or proposed)* include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a **discharge** to **waters of the U.S.**? (FORM 2B)		X	
C. Is this a facility which currently results in **discharges** to **waters of the U.S.** other than those described in A or B above? (FORM 2C)		X	
D. Is this a proposed facility *(other than those described in A or B above)* which will result in a **discharge** to **waters of the U.S.**? (FORM 2D)		X	
E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3)	X		Form 3
F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X	
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X	
H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)		X	
I. Is this facility a proposed **stationary source** which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)		X	
J. Is this facility a proposed **stationary source** which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)		X	

III. NAME OF FACILITY

1 SKIP VERNITRON PIEZOELECTRIC DIVISION

IV. FACILITY CONTACT

A. NAME & TITLE (last, first, & title)	B. PHONE (area code & no.)
2 C. G. STEVENS, ENG. MGR.	216 232 8600

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 232 FORBES ROAD

B. CITY OR TOWN	C. STATE	D. ZIP CODE
4 BEDFORD	OH	44146

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5 232 FORBES ROAD

B. COUNTY NAME

CUYAHOGA COUNTY

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE (if known)
6 BEDFORD	OH	44146	

VII. SIC CODES (4-digit, in order of priority)

A. FIRST		B. SECOND	
C 7	3269 (specify) Pottery Products NEC	C 7	3679 (specify) Electronic Components and Accessories

C. THIRD		D. FOURTH	
C 7	3264 (specify) Porcelain Electronic Supplies	C 7	3294 (specify) Minerals and Earth, Ground or otherwise treated

VIII. OPERATOR INFORMATION

A. NAME

C 8 VERNITRON CORPORATION

B. Is the name listed in Item VIII-A also the owner? XX YES ☐ NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)

F = FEDERAL
S = STATE
P = PRIVATE
M = PUBLIC (other than federal or state)
O = OTHER (specify)

(specify)

D. PHONE (area code & no.)

C A 516 778 8200

E. STREET OR P.O. BOX

001 MARCUS AVENUE

F. CITY OR TOWN	G. STATE	H. ZIP CODE
C 8 LAKE SUCCESS	NY	11042

IX. INDIAN LAND

Is the facility located on Indian lands?

☐ YES ☒ NO

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharges to Surface Water)	D. PSD (Air Emissions from Proposed Sources)	
C T I 9 N	C T I 9 P	
B. UIC (Underground Injection of Fluids)	**E. OTHER (specify)**	
C T I 9 U OHD052324290	C T I 9	(specify)
C. RCRA (Hazardous Wastes)	**E. OTHER (specify)**	
C T I 9 R	C T I 9	(specify)

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property bounderies. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS (provide a brief description)

Manufacturer of ceramic used in mechanical to electrical and electrical to mechanical transducers and sold to manufacturers of electrical and electronic sensors and equipment. Products also include bandpass radio filters, fuel ignition devices, tone generators.

XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
Benjamin K. Sachs, Vice President	Benjamin K. Sachs	11/23/82

COMMENTS FOR OFFICIAL USE ONLY

C C

FORM 3 RCRA

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY
HAZARDOUS WASTE PERMIT APPLICATION
Consolidated Permits Program
(This information is required under Section 3005 of RCRA.)

I. EPA I.D. NUMBER

F OHD052324290 T/A C 1

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS
		NOV 29 1982

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

[X] 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

C 8 | YR. 58 | MO. 06 | DAY 02 | FOR EXISTING FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

[ ] 2. NEW FACILITY *(Complete item below.)*

YR. | MO. | DAY | FOR NEW FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR IS EXPECTED TO BEGIN

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

[ ] 1. FACILITY HAS INTERIM STATUS

[ ] 2. FACILITY HAS A RCRA PERMIT

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE — Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY — For each code entered in column A enter the capacity of the process.
1. AMOUNT — Enter the amount.
2. UNIT OF MEASURE — For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER *(barrel, drum, etc.)*	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D79	GALLONS OR LITERS
LANDFILL	D80	ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER
LAND APPLICATION	D81	ACRES OR HECTARES
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)*	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G
LITERS	L
CUBIC YARDS	Y
CUBIC METERS	C
GALLONS PER DAY	U
LITERS PER DAY	V
TONS PER HOUR	D
METRIC TONS PER HOUR	W
GALLONS PER HOUR	E
LITERS PER HOUR	H
ACRE-FEET	A
HECTARE-METER	F
ACRES	B
HECTARES	Q

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C | DUP | T/A C 1

LINE NUMBER	A. PROCESS CODE (from list above)	B.1. AMOUNT (specify)	B.2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S 0 2	600	G	
X-2	T 0 3	20	E	
1	S 0 1	100,000	G	
2	S 0 2	10,000	G	
3	T 0 1	100	G	
4				
5				
6				
7				
8				
9				
10				

Continued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

VERNITRON

Form Approved OMB No. 158-S80004

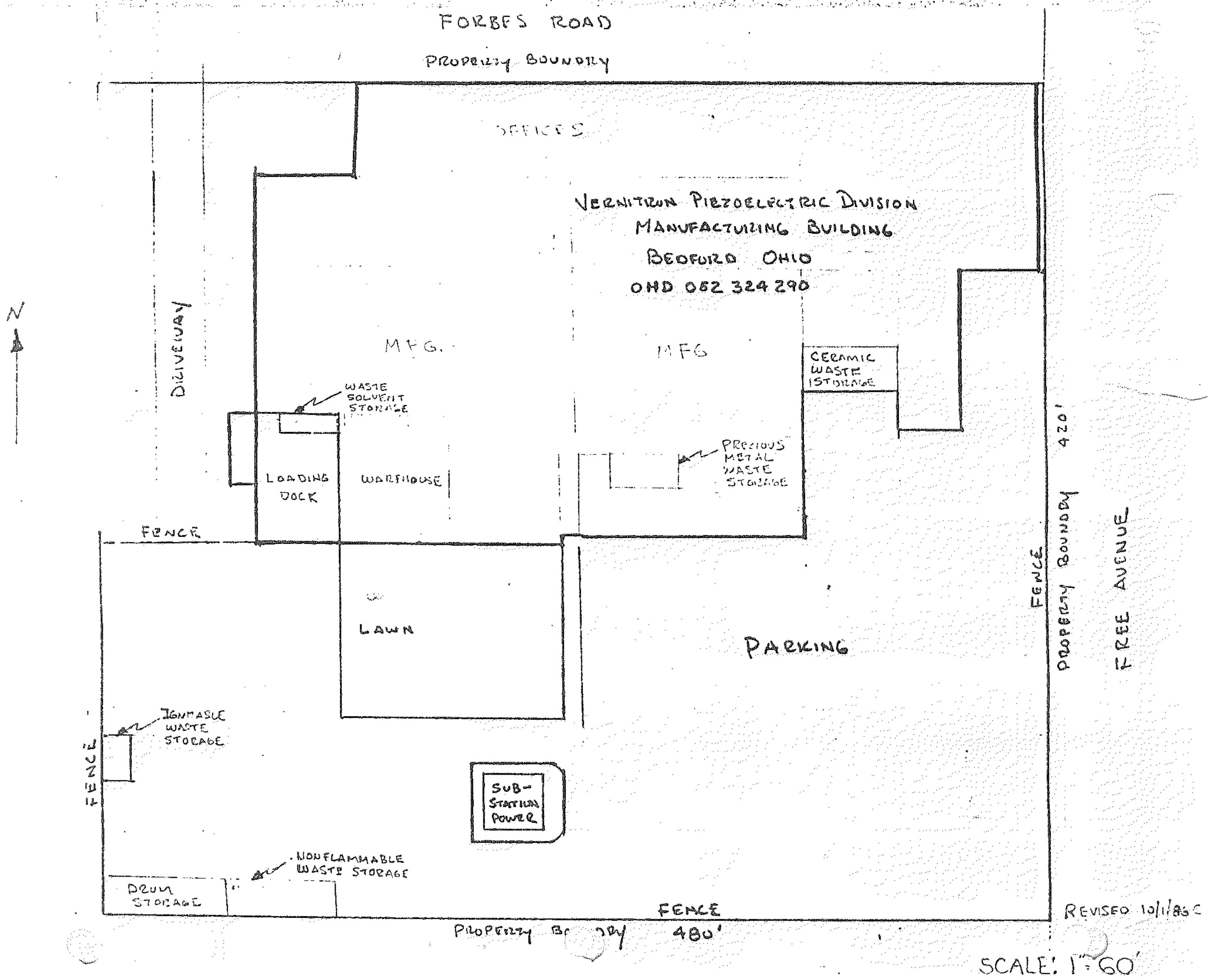
EPA I.D. NUMBER (enter from page 1)		FOR OFFICIAL USE ONLY		
W 1		W DUP 2	DUP	NOV 29 1982

RECEIVED

DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	D008	36,000	P	S01	S02	T01		
2	U210	23,000	P	S01				
3	D011	150	P	S01	T01			
4	D005	20	P	S01	T01			
5	D007	10	P	S01	T01			
6	F001	3,500	P	S01				
7	F003	1,000	P	S01				
8	F005	2,000	P	S01				
9	U239	700	P	S01				
10	Antimony	15	P	S01	T01			
11	Nickel	200	P	S01	S02	T01		
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

CONTINUE ON REVERSE



FORBES ROAD
PROPERTY BOUNDRY
OFFICES
VERNITRON PIEZOELECTRIC DIVISION
MANUFACTURING BUILDING
BEDFORD OHIO
OHD 052 324 290
N
DRIVEWAY
MFG.
MFG
CERAMIC WASTE STORAGE
WASTE SOLVENT STORAGE
PRECIOUS METAL WASTE STORAGE
LOADING DOCK
WAREHOUSE
FENCE
LAWN
PARKING
420'
PROPERTY BOUNDRY
FREE AVENUE
IGNITABLE WASTE STORAGE
SUB-STATION POWER
NONFLAMMABLE WASTE STORAGE
DRUM STORAGE
REVISED 10/1/85
480'
SCALE: 1"=60'

IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

EPA I.D. NO. *(enter from page 1)*

F OH D 05 2 32 4 29 0 | T/A | C 6

V. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail).*

VI. PHOTOGRAPHS

All existing facilities must include photographs *(aerial or ground–level)* that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail).*

VII. FACILITY GEOGRAPHIC LOCATION

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*
81 3 1 1 5	4 1 2 2 0

VIII. FACILITY OWNER

☐ A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. *(area code & no.)*
E	- -

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE
F	G		

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

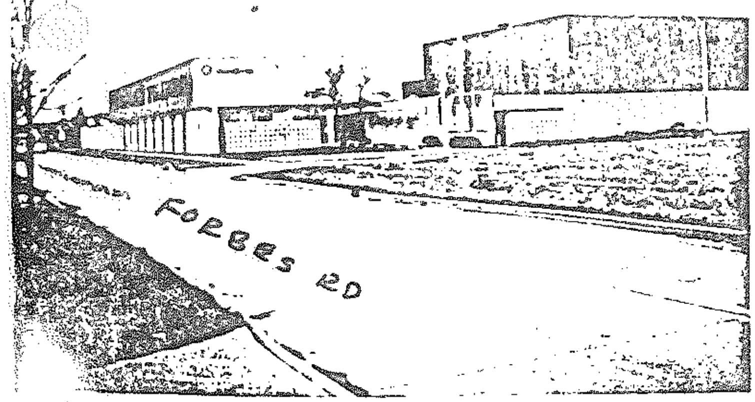
A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED
Benjamin K. Sachs, Vice President	Benjamin K. Sachs	11/23/82

X. OPERATOR CERTIFICATION

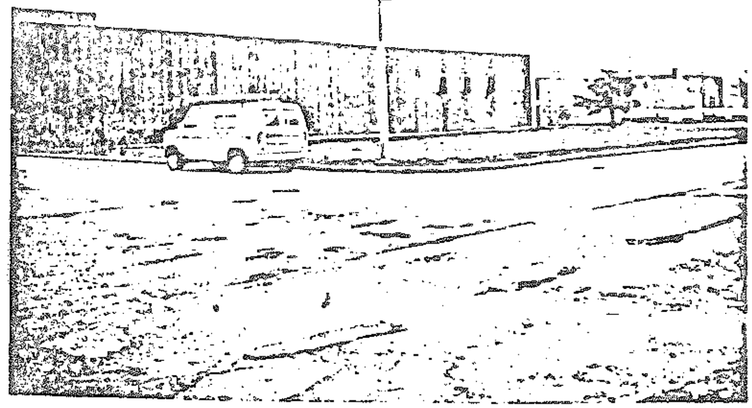
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED

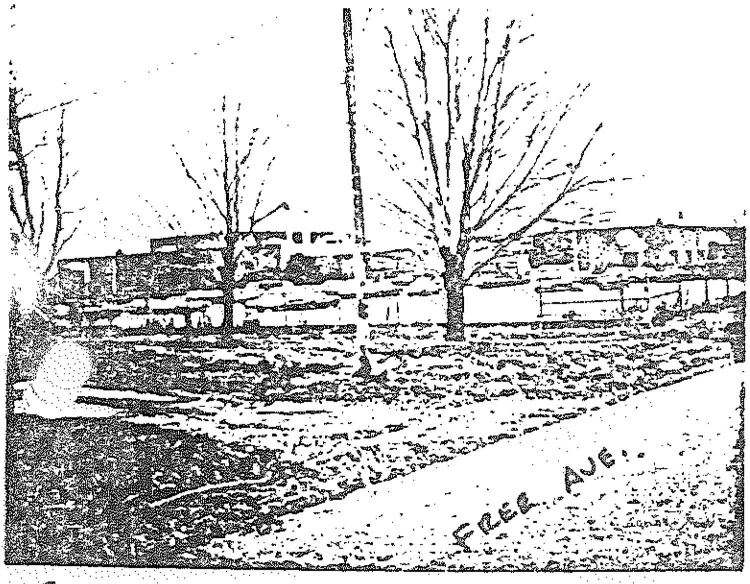
CONTINUE ON PAGE 5



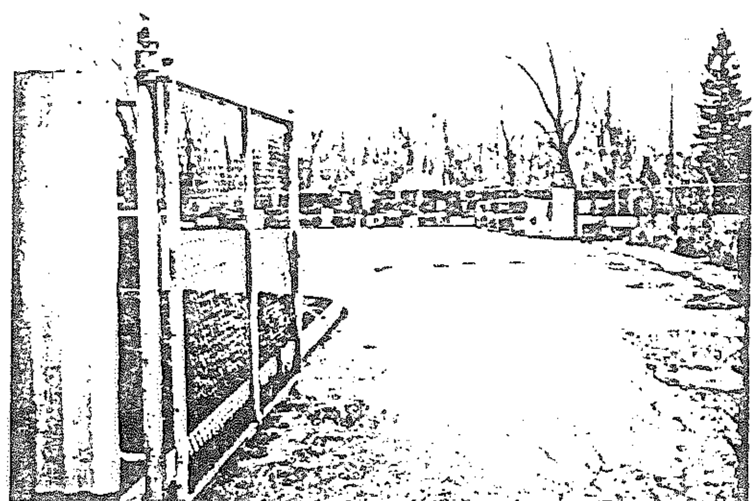
NORTHWEST CORNER



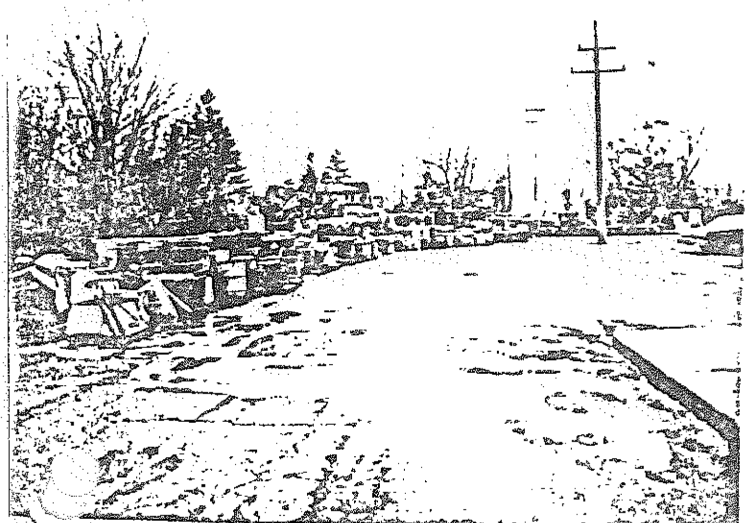
SOUTH ELEVATION



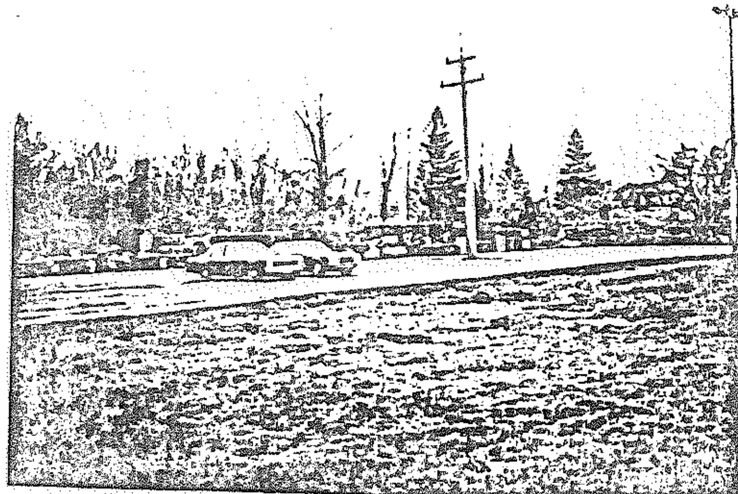
SOUTH ELEVATION



DRUM STORAGE SOUTH WEST CORNER

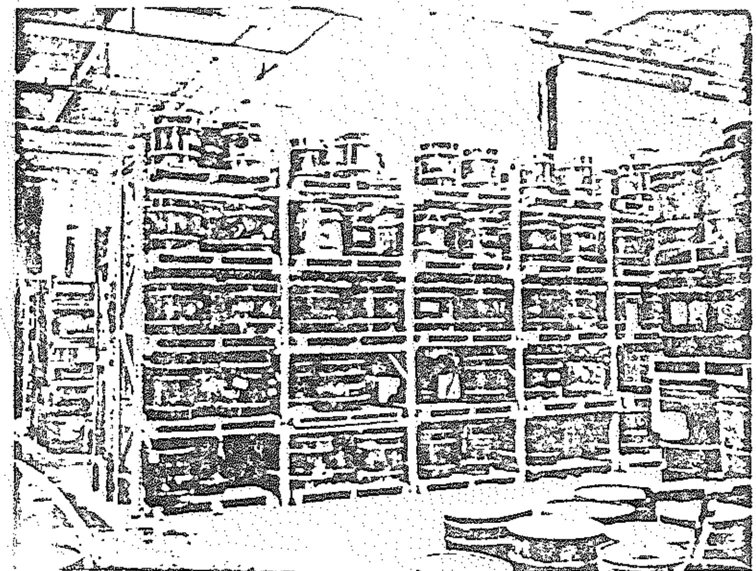


DRUM STORAGE

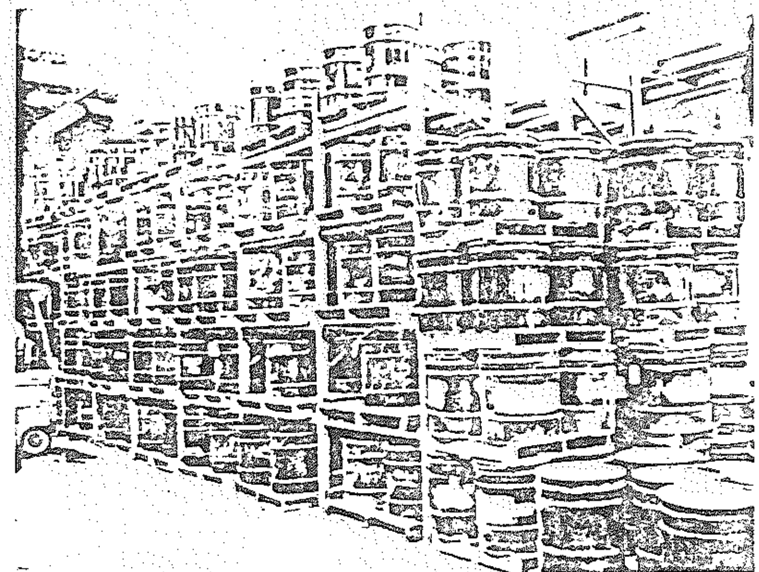


DRUM STORAGE SOUTH WEST CORNER

OHD052324290



DRUM STORAGE EAST RACK WAREHOUSE



DRUM STORAGE WEST RACK WAREHOUSE

OHD052324290

VPD Partial Closure

VERNITRON PIEZOELECTRIC DIVISION HAZARDOUS WASTE STORAGE CLOSURE PLAN TO CHANGE PERMIT STATUS TO GENERATOR

These amendments are to provide information to insure compliance with the requirements of withdrawing the request for permission to store hazardous wastes at Vernitron Piezoeledtric Division. It is the intent of Vernitron Piezoelectric Division (VPD) to continure its practice of recycling, selling beneficially and recovering all hazardous wastes generated at VPD in accordance with current EPA and RCRA regulations. The implementation of this plan will be in accordance with the December 10, 1985 Closure Plan Review Guidance (Draft) and the November 28, 1986 ammendments to above Closure Plan Review Guidance (Draft).

CLEANING OF HAZARDOUS WASTE STORAGE AREAS

Outdoor Storage Area

The designated outdoor hazardous waste storage area is located in the South-West corner of the asphalt paved area bounded by a chain-link fence. The cleaning of this area involves the removal of all stored hazardous waste. The liquid wastes will be disposed of toa recycle facility, Liberty Solvents, within thirty (30) days of this plan's acceptance by EPA of Ohio. The solid hazardous waste will be disposed of by recycling, sale or removal of hazardous material (primarily lead) within 120 days of this plan's acceptance by EPA of Ohio.

Inside Storage Area

The designated area used for packaging and storage of hazardous solid wastes is located in the warehouse opposite the overhead door leading to the powder preparation department. The solid hazardous waste material stored in this area will be packaged in fiber drums and disposed of as described above in the section on Outside Storage Area within 120 days of this plan's acceptance by EPA of Ohio. This area is also used for the storage of solvent hazardous wastes (perchlorethylene, toluene and mineral oil contaminated with perchlorethylene). The hazardous waste solvents will also be disposed of as described above in the section on Outside Storage Area.

The floor of this area will be vacuumed using the Nilfisk vacuum cleaner with high efficiency filters. The floor will then be wet scrubbed with our power floor scrubber.

NOTE:

The inside storage area for hazardous wastes is common to the storage of permitted and unpermitted hazardous wastes. In addition, raw materials and inprocess materials also share the same storage area and facilities. It must be acknowledged that the identical material considered hazardous in our wastes is the raw material (lead), in process materials (contain lead) and finished materials (also contain lead) required for the operation of this manufacturing facility. It is not practical nor possible to discriminate the presence of lead from permitted hazardous waste materials, non-permitted hazardous waste materials, raw materials, in process materials or finished materials. The common warehouse area will be controlled through labeling of all materials and timely recycling, sale and salvage of generated hazardous waste materials.

TESTING OF CLOSED HAZARDOUS MATERIAL STORAGE AREAS

Outdoor Storage Area

The outside storage area for hazardous waste storage will be sampled to test for contamination of the soil adjoining the paved storage area. The sampling will consist of extracting cores of soil from at least four (4) places in the area bordering the storage area. This sample positions will be approximately three (3) feet West and South of the storage area perimeter fence at approximately twenty (20) foot intervals. In addition, at least four (4) background samples will be taken approximately fifty (50) feet West of the the storage area perimeter fence. This proceedure is in accordance with the Closure Plan Review Guidance.

The test samples will be taken to a depth of six (6) inches. The individural samples will be the tested for total metals in accordance with the methods outlined in U.S. EPA'S Publication SW-846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods".
All of the sampling will be performed by an independent consultant and certified that the sampling was performed properly. The clean levels to be obtained will be in accordance with the limits outlined in the Closure Plan Review Guidance.

Inside Storage Area

The inside hazardous waste storage area floor will be rinsed with water at least two times and then wetted with deionized water. The area will be then vacuumed. Two samples will be then collected and then analysed for residual hazardous waste material which will be then tested for total metals and residual solvents with the methods outlined in U.S. EPA'S Publication SW-846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" and gas chromotography analysis will be used to determine the presence of solvents in the collected water samples.

SCHEDULE FOR HAZARDOUS WASTE STORAGE CLOSURE PLAN TO CHANGE PERMIT TO GENERATOR

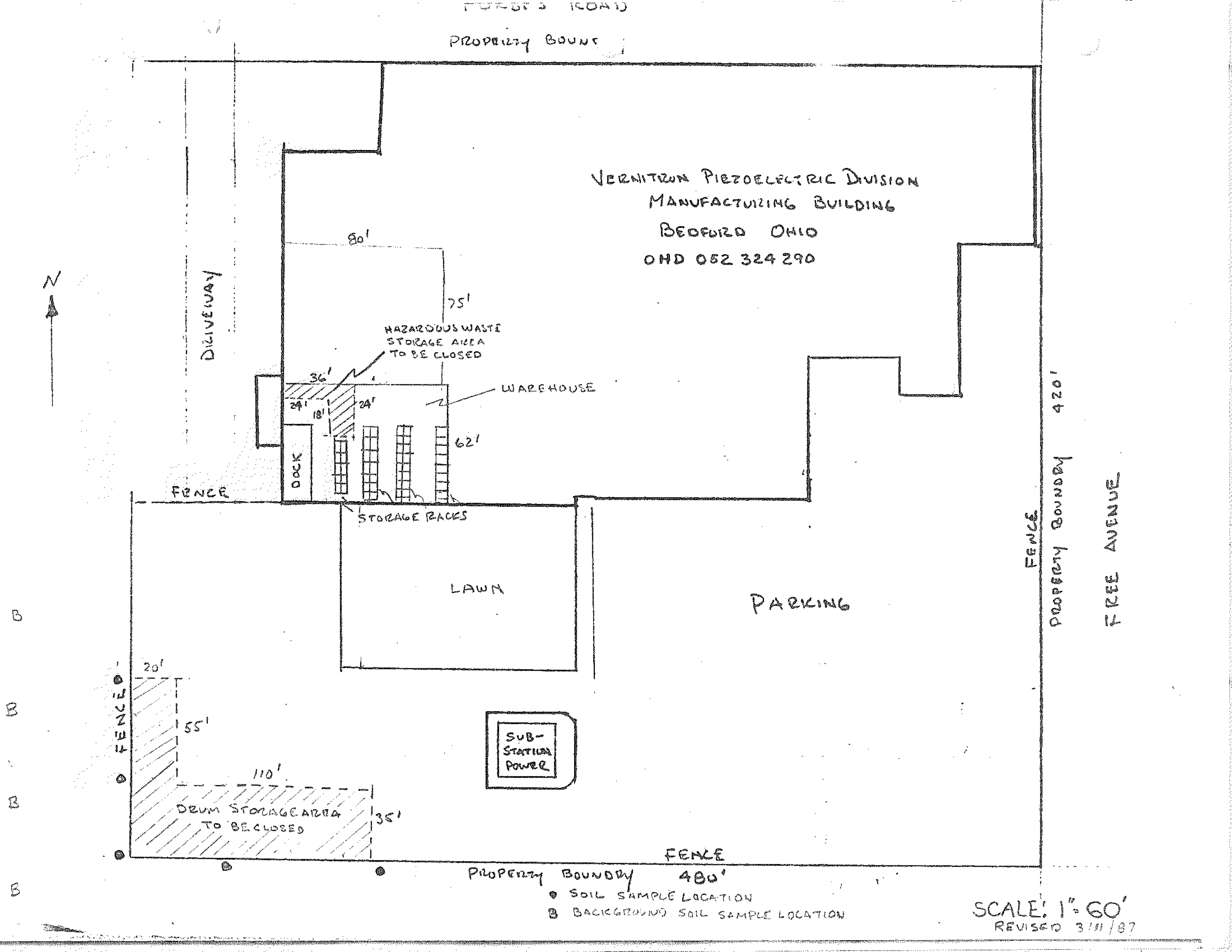
Sampling of soil adjacent to the Outside Storage Area - within three weeks of this plans date.

Sampling of warehouse floor Inside Storage Area will be done at same time as Outside Storage Area sampling.

Testing of the samples is estimated to require four weeks, which includes review and certification of the test proceedure and the results of the sample analyses.

The sampling and testing can proceed at the above times because Vernitron has already disposed of the hazardous waste materials formerly stored in the areas described in this plan for closure to change the Vernitron permit status to generator.

All of the activities outlined above to complete the Hazardous Waste Material Storage Closure should be accompolished within 90 days of the plan's approval by the OHIO EPA.


FORBES ROAD
PROPERTY BOUNDARY
VERNITRON PIEZOELECTRIC DIVISION
MANUFACTURING BUILDING
BEDFORD OHIO
OHD 052 324 290
DRIVEWAY
N
80'
75'
HAZARDOUS WASTE
STORAGE AREA
TO BE CLOSED
36'
24'
18'
24'
WAREHOUSE
62'
DOCK
FENCE
STORAGE RACKS
LAWN
PARKING
FENCE
PROPERTY BOUNDARY 420'
FREE AVENUE
20'
55'
110'
35'
DRUM STORAGE AREA
TO BE CLOSED
SUB-STATION POWER
FENCE
B
B
B
B
FENCE
PROPERTY BOUNDARY 480'
● SOIL SAMPLE LOCATION
B BACKGROUND SOIL SAMPLE LOCATION
SCALE: 1" = 60'
REVISED 3/11/87

OhioEPA

State of Ohio Environmental Protection Agency

P.O. Box 1049, 361 E. Broad Street
Columbus, Ohio 43266-1049
(614) 466-8565

Richard F. Celeste
Governor

VERNITRON
MAY 12 1987
RECEIVED

CERTIFIED MAIL

May 7, 1987

Re: CLOSURE PLAN
VERNITRON PIEZOELECTRIC
OHD052324290/02-18-0649

Mr. Cas Stevens, Safety Director
Vernitron Piezoelectric Division
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146-5478

Mr. Stevens:

On December 15, 1986, Vernitron Piezoelectric Division submitted to Ohio EPA a closure plan for an indoor hazardous waste storage area and an outdoor hazardous waste drum storage area. These areas are located at 232 Forbes Road, Bedford, Ohio. Revisions to the closure plan were received on March 12, 1987. The closure plan was submitted pursuant to Rule 3745-66-12 of the Ohio Administrative Code (OAC) in order to demonstrate that Vernitron's proposal for closure complies with the requirements of OAC Rules 3745-66-11 and 3745-66-12.

The public was given the opportunity to submit written comments regarding the closure plan of Vernitron Piezoelectric in accordance with OAC Rule 3745-66-12. No comments were received by Ohio EPA in this matter.

Based upon review of the company's submittal and subsequent revisions, I conclude that the closure plan for the hazardous waste facility at Vernitron Piezoelectric meets the performance standard contained in OAC Rule 3745-66-11 and complies with the pertinent parts of OAC Rule 3745-66-12.

The closure plan submitted to Ohio EPA by Vernitron Piezoelectric is hereby approved with the following conditions:

1. The facility map received by the Ohio EPA Northeast District Office (NEDO), Division of Solid and Hazardous Waste Management (DSHWM), on March 12, 1987, shall be incorporated into the partial closure plan.

2. This closure plan approval shall address only the hazardous waste management units used by Vernitron Piezoelectric for the storage of hazardous wastes for greater than ninety (90) days.

3. The inside storage area to under go closure shall be defined as the shaded warehouse area of the facility's revised facility map; the outside storage area to under go closure shall be defined as the shaded area of the revised facility map designated "drum storage area" (revised facility map dated March 11, 1987).

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Shall Date 5-7-87

Ohio Environmental Protection Agency
ENTERED DIRECTOR'S JOURNAL
MAY -7 1987

4. Vernitron Piezoelectric shall clean the paved surface of the outside storage area using the same method as that specified in the revised closure plan for the inside storage area. Liquid and solid residues collected from the cleaning of the inside and outside storage areas, if determined to be hazardous waste through analysis, shall be managed in accordance with state and federal hazardous waste regulations.

5. The paved surface of the outside storage area shall also be tested to confirm that cleaning activities have been adequate using the same method as that found in the revised closure plan for the inside storage area concrete. The inside and outside storage area surfaces shall be tested separately.

6. Vernitron Piezoelectric shall analyze storage area rinseate water samples for organic compounds using Methods 8010 and 8020 of USEPA Publication SW-846 (Test Methods for Evaluating Solid Waste, Physical/Chemical Methods) and for the eight (8) EP metals using the EP Toxicity Test Procedure (also found in USEPA Publication SW-846). Rinseate analysis results shall be reported to the appropriate Ohio EPA NEDO DSHWM personnel within ten (10) working days of their receipt by Vernitron Piezoelectric. No more than 1 mg/l of any RCRA-regulated solvent shall be detected in the water samples in order for the storage areas to be considered "clean." Additionally, metals values shall be less than their respective maximum concentrations for characteristics of EP Toxicity.

7. Vernitron Piezoelectric shall collect an additional soil core sample at a location at or near the southwest corner of the property fence, for a total of five (5) soil sampling locations and four (4) background sampling locations. The sampling device shall be decontaminated between each use by washing and then rinsing with deionized water. The five (5) soil samples shall be located as near to the perimeter fence as possible to detect any contamination from run-off from the storage area.

8. Samples collected at each of the five (5) soil sampling locations shall also be analyzed for organic compounds using SW-846 Method 8240. All compounds detectable by the method shall be analyzed for and reported, if found.

9. Total metals results from the analysis of the nine (9) soil sampling locations and organics results from the analysis of the five (5) soil sampling locations shall be submitted to the appropriate Ohio EPA NEDO DSHWM personnel within ten (10) working days of their receipt by Vernitron Piezoelectric. Vernitron Piezoelectric shall select from the attached, a means by which background and closure soil samples shall be compared to determine if soils in excavated areas are significantly contaminated with naturally occurring elements from past waste management practices. This material shall be submitted to the Ohio EPA, NEDO DSHWM within ten (10) working days of the receipt of this letter. If any RCRA-regulated organic compound is detected in the samples, the soil shall be considered contaminated. In the event that contamination is found, Vernitron Piezoelectric shall notify the appropriate Ohio EPA NEDO DSHWM personnel within ten (10) working days of the receipt of sample results by Vernitron Piezoelectric. Contaminated soil shall be removed and managed as hazardous waste.

Please be advised that approval of this closure plan does not release Vernitron Piezoelectric from any responsibilities as required under the Hazardous and Solid Waste Amendments of 1984 regarding corrective action for all releases of hazardous waste or constituents from any solid waste management unit, regardless of the time at which waste was placed in the unit.

Due to the fact that the Ohio EPA is not currently authorized to conduct the federal hazardous waste program in Ohio, your closure plan also must be reviewed and approved by USEPA. Federal RCRA closure regulations (40 CFR 265.112) require that you submit a closure plan to George Hamper, Chief, Waste Management Division, Technical Programs Section, Ohio Unit, USEPA, Region V, 5HS-13, 230 South Dearborn Street, Chicago, Illinois 60604. Approval by both agencies is necessary prior to commencement of activities required by the approved closure plan.

You are notified that this action of the Director is final and may be appealed to the Environmental Board of Review pursuant to Section 3745.04 of the Ohio Revised Code. The appeal must be in writing and set forth the action complained of and the grounds upon which the appeal is based. It must be filed with the Environmental Board of Review within thirty (30) days after notice of the Director's action. A copy of the appeal must be served on the Director of the Ohio Environmental Protection Agency and the Environmental Enforcement Section of the Office of the Attorney General within three (3) days of filing with the Board. An appeal may be filed with the Environmental Board of Review at the following address: Environmental Board of Review, 250 East Town Street, Room 101, Columbus, Ohio 43266-0557.

When closure is completed, the Ohio Administrative Code Rule 3745-66-15 requires the owner or operator of a facility to submit to the Director of the Ohio EPA certification by the owner or operator and a registered professional engineer that the facility has been closed in accordance with the approved closure plan. The certification by the owner or operator should include the statement found in OAC 3745-50-42(D). These certifications should be submitted to: Ohio Environmental Protection Agency, Division of Solid and Hazardous Waste Management, Attn: Thomas Crepeau, Program Planning and Management Section, P.O. Box 1049, Columbus, Ohio 43266-1049.

Warren W. Tyler

DF/ara

cc: Thomas Crepeau/Central File, Ohio EPA, DSHWM
George Hamper, USEPA, Region V
Rebecca Strom, USEPA, Region V
Debby Berg, Ohio EPA, NEDO

VERNITRON
MAY 12 1987
RECEIVED

1370U

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Shadl Date 5-7-87

Ohio Environmental Protection Agency
ENTERED DIRECTOR'S JOURNAL
MAY -7 1987

ATTACHMENT

NATURALLY OCCURRING ELEMENTS OR COMPOUNDS

Alternative A - Soils containing naturally occurring elements in the area of the hazardous waste management unit shall be considered to be contaminated if concentrations in the soils exceed the mean of the background samples plus two standard deviations.

All metals analyses must be for total metals.

Alternative B - Soils containing RCRA-regulated metals shall be considered to be contaminated if concentrations in the soil exceed the upper limit of the range for Ohio farm soils, as given below:

Metal	Range (Total Metal Concentration in ug/g)
Cadmium	0 - 2.9
Chromium	4 - 23
Lead	9 - 39

(Source: Logan, T.J. and R.H. Miller, 1983. Background Levels of Heavy Metals in Ohio Farm Soils. Research Circular 275, Ohio State University, Ohio Agricultural Research and Development Center, Wooster.)

All metals analyses must be for total metals.

Ohio EPA may reject any of the above alternatives based on site-specific information. Also, the Agency may accept alternate statistical methods if the owner/operator can demonstrate that the statistical method proposed is environmentally acceptable and is technically superior.

1370U

Henry R. Friedberg & Associates

10 December 1986

Mr. C. G. Stevens
Quality Control Manager
Vernitron Piezoelectric Division
232 Forbes Road
BEDFORD, OHIO 44146

amended Proposal
EPA Closure Sampling

Dear Mr. Stevens,

In order to meet the latest requirements of the Ohio EPA we are revising our previous proposal for Sampling and Chemical Analysis of your Hazardous Waste Storage areas as follows:

> We will sample the soil along the fence outside the concrete pad storage area by taking four core-type samples and similarily sample the soil in an area approximately 50 feet west of the fence by taking four background samples.
>
> All eight samples will be analyzed for total metals. The chemical analysis will include the standard 8 listed metals as well as Antimony and Nickel.
>
> We will sample the concrete Hazardous Waste Storage area inside the plant by soaking the area with tap water and then removing a portion of that water as sample. The process will be repeated so that a total of two samples are obtained.
>
> These two water samples will be analyzed for total metals as above. In addition, they will be run for Volatiles by GC/MS.
>
> All sampling and testing procedures will be in accordance with applicable sections of 40CFR261

P.O. Box 45220, Cleveland, Ohio 44145, (216) 333-2843

Henry R. Friedberg & Associates

Mr. C. G. Stevens, QC Manager
Vernitron Piezoelectric Division
Bedford, Ohio

and 265. The Chemical Analysis Methods will be in accordance with SW-846. Acid Digestion will be used to obtain the total metals.

Upon completion of sampling and testing a detailed report will be issued which will be certified by a Professional Engineer registered in the State of Ohio.

COST ESTIMATE:

Sampling, sample preparation and report		$ [redacted]
Certification		
Chemical Analysis	8 soil samples	
	2 water samples	
GC/MS Volatiles	2 water samples	
	total Cost	$[redacted]

A tentative sampling date is 22 December 1986 and analysis results will be available approximately three weeks after sample preparation. We would appreciate receiving your Purchase Order to cover this work including the usual check for a Retainer of $500. The opportunity to serve you again will be welcomed.

Sincerely,

HENRY R. FRIEDBERG & ASSOCIATES

Henry R. Friedberg, CMfgE, CEE.

HRF:cp

P.O. Box 45220, Cleveland, Ohio 44145, (216) 333-2843

Henry R. Friedberg,
- CEF
- CMfgE

offers over 35 years experience in...

- metal finishing in the plant and in the laboratory
- analytical chemistry as a tool to problem solving
- materials investigations and quality control
- failure analysis and corrosion problems
- waste treatment systems and disposal
- water quality and recovery
- air, water and stack sampling

HENRY R. FRIEDBERG & ASSOCIATES

P.O. BOX 45220
CLEVELAND, OH 44145
216/333-2843

Consultants in....

METAL FINISHING & SURFACE TREATMENTS

MATERIALS & CORROSION STUDIES

RESOURCE CONSERVATION & RECOVERY ACT SURVEYS

WASTE DISPOSAL & POLLUTION ABATEMENT

ANALYSIS-TESTING

OSHA SURVEYS

OVERSEAS CARGO INSPECTIONS

ACTIVE as officer and/or member in:

American Electroplaters Society

American Society for Metals

Association for Finishing Processes of SME

ASTM D-34 Committee on Waste Disposal

AMERICAN CHEMICAL SOCIETY Division of Small Chemical Businesses

Fee Schedule available on request

HENRY R. FRIEDBERG & ASSOCIATES

CONSULTANTS

P.O. BOX 45220
CLEVELAND, OH 44145
216—333-2843

PROFILE:

HENRY R. FRIEDBERG & ASSOCIATES was organized in 1978 as an Independent Consulting Group to serve Business and Industry in a number of areas including Materials Management, Metal Finishing and Surface Treatments, Environmental Compliance, and the Treatment and Disposal of Wastes including Hazardous Materials.

Henry R. Friedberg, CEF, CMfgE, is President. He has

EXPERTISE IN THE AREAS OF:

- finishing (electroplating, painting, other finishes)
- materials investigations and quality control
- corrosion problems
- Resource Conservation and Recovery Act Surveys (RCRA)
- Hazard Communication Act; "Employee Right to Know" laws
- hazardous wastes regulations
- waste disposal and pollution studies
- water quality and recovery
- analysis and testing

EXPERIENCE:

- over 35 years actively engaged in finishing in plant and laboratory, including in-house supervision and administration as well as outside on a consulting basis
- well versed in analytical chemistry as a tool to problem solving
- thoroughly familiar with environmental regulations, air and stack sampling, waste disposal, pesticide residues, hazardous wastes
- worked in plants throughout the United States, Canada and Europe, encompassing industries such as foundries, steel mills, power plants, chemical processing, smelters, manufacturing, aircraft and space components, electroplating and paint shops
- served as legal expert in patent and other litigation
- competent in teaching and training of chemists, laboratory technicians and plant process operators

PREVIOUS AFFILIATIONS:

- Served from 1954 until the firm was sold in 1976 as Vice President and before that as Technical Director with CROBAUGH LABORATORIES, Cleveland Ohio (an independent Consulting Laboratory founded in 1894), directed the day to day operations of the laboratory, assigned and supervised projects, developed methods and procedures, trained chemists, and provided consulting services to industrial clients similar to the services provided today.

- employed prior to 1954 specializing in Metal Finishing, providing technical expertise and services in electroplating, phosphate coating and painting, and related areas; worked as Chemist during World War II on military projects and then was appointed Chemist in charge of the Materials Control Laboratory of HAMILTON STANDARD DIVISION, UNITED AIRCRAFT CORPORATION, East Hartford Connecticut; duties there included technical supervision of a number of anodizing, painting, and electroplating operations at several Hamilton plants.

EDUCATION:

- born and educated in Germany including undergraduate training, later attended University of Connecticut; presently on the Faculty of Cleveland State University, Continuing Education Division, as Instructor for Electroplating Technology.
- certified as CMfgE (Certified Manufacturing Engineer, Finishing Management) by the Association for Finishing Processes/SME.
- certified as CEF (Certified Electroplater Finisher) by the American Electroplaters Society.

MEMBERSHIPS:

- ASM AMERICAN SOCIETY FOR METALS
- ASTM AMERICAN SOCIETY FOR TESTING MATERIALS
  member of Committee D-34 Waste Disposal
- AES AMERICAN ELECTROPLATERS SOCIETY
  Chairman Advisory Committee to CSU,
  past member National Publications Board, Delegate,
  Past President Cleveland Branch, Man of the Year Award
- AFP ASSOCIATION FOR FINISHING PROCESSES/SME
  Chairman Chapter 231 Ohio/Western PA,
  Awards for Special Services
- ACS AMERICAN CHEMICAL SOCIETY, Div.Small Chem.Businesses

PUBLICATIONS and PRESENTATIONS:

Chemistry for Electroplaters and Electroplating Technology
Instructor, Cleveland State University, 1974 to present

Principles of Corrosion and
Testing and Evaluation of Deposits
Invited Lecturer, AES Intensive Training Course
Novi Michigan, November 1984

EPA Up-date, covering VOC Regulations, Pre-Treatment Guidelines, and RCRA
PRODUCTS FINISHING, April 1983

Start a Business?
CHEMTECH (American Chemical Society) April 1982

Air Pollution Control Requirements &
Air Pollution Control Techniques on the Production Paint Line
PRODUCTS FINISHING, February and March 1982

Production Painting Environmental Compliance
10th Annual Industrial Waste Institute
Invited Lecturer, University of Wisconsin,
Madison Wisconsin December 1981

RCRA: Where To?
An Up-date on Hazardous Waste Disposal Regulations
PRODUCTS FINISHING, August 1981

Hazardous Wastes and the Coating Industry
Seminar Leader, Cleveland, April 1981

Starting a Small Chemical Business
American Chemical Society, Div. of Small Chemical Businesses
ACS Meeting, Atlanta, March 1981

What will Plating do for a Product?
PROCEEDINGS, AES Symposium "Design for Plating"
Lake Buena Vista, February 1981

Hazardous Wastes and RCRA
Seminar Leader, Cleveland State University, 1979

Electroplating for the Non-Plater
Seminar Leader, Cleveland State University, 1979

Hazardous Wastes, an Up-date on RCRA
PRODUCTS FINISHING, 1979

PUBLICATIONS and PRESENTATIONS (cont'd)

The Chemistry of Metallurgical Failure Analysis
Invited Lecturer, Class of Ph.D. Candidates,
Department of Metallurgy and Material Sciences
Case Western Reserve University, Cleveland, 1975, 1977

PCB's in the Food Chain
Institute of Food Technologists, 1974

Recycling and Recovery of Metal Finishing Wastes
PLATING, February 1973

Atmospheric Pollution Problems associated with Metal Finishing
Instructor, Center for Professional Advancement, 1972

Solid Waste Disposal from Metal Finishing
Instructor, Center for Professional Advancement, 1972

Recycling and Recovery of Metal Finishing Wastes
AES TECHNICAL CONFERENCE, 1972

Sampling from the Atmosphere (Air Pollution)
Instructor, Center for Professional Advancement, 1972

Particle Size Distribution of Airborne Particles
AICHE MEETING, New Orleans 1969

Particle Size of Soluble Particles
COULTER PARTICLE CONFERENCE, New York 1969

Testing of Plastics,
Instructor, Erieside Institute, 1969

Particle Size Analysis by Instrumentation
ACS MEETING, Akron 1968

Fast Accurate Count of Minute Particles
CHEMICAL PROCESSING, October 1965

Lead Anodes for Chromium Plating
PLATING 1959

Spectrochemical Determination of Potassium in Mixed Fertilizers
SOCIETY OF SPECTROSCOPY, Cleveland 1957

Spectrochemical Determination of Nickel in Bright Cadmium Sol'ns
AES ANNUAL MEETING and PROCEEDINGS 1956

HENRY R. FRIEDBERG & ASSOCIATES
Consultants

P.O. Box 45220
CLEVELAND, OHIO 44145
216   333-2843

S C H E D U L E   O F   F E E S :

****

BASE RATE for consulting time minimum $200.00	$ [redacted] PER HOUR
SINGLE DAYS (8 hours)	$[redacted]
Special Projects	by quotation
Laboratory analysis and testing	standard fees
Long term projects	usually based on monthly billing against Retainer, rate is $60 per hour of actual time spent
Consultation outside of Cuyahoga County	add travel expenses: mileage, other travel, meals, lodging, travel time.

++++++++++

HRF:cp

Emergency Plan

VERNITRON PIEZOELECTRIC DIVISION EMERGENCY PLAN

COMPANY POLICY

The policy of Vernitron Corporation has always been to eliminate the conditions which might cause accidental losses to its people and its property. Our goal is to protect our employees, visitors, customers, the general public and the environment. Every individual in the organization is charged with the responsibility of achieving that goal.

The General Manager will designate a Director of Emergency Planning who will be responsible for the training and administration of employees responsible for performing disaster-control duties during an emergency situation. The General Manager will also designate an alternate director.

DIRECTOR RESPOSIBILITIES

The Emergency Plan Director will be responsible for communications, fire fighting, first aid and medical service, damage repair, investigation and coordination of outside emergency services. He is also responsible for training of personnel in both the routine handling of hazardous wastes and any emergencies involving hazardous wastes including spill control of hazardous materials.

COMMUNICATIONS

Employees will be notified of the existence of an emergency by announcement over the public address system. The public address system will switch to a battery powered system in the event of an electrical power failure. The public address system also has an emergency audio signal that can be activated by either the telephone operator or by any employee in the approximate center of the building. If the public address system is inoperative, then Supervisors and lead persons will be informed by messengers and each supervisor will be responsible for insuring that all of their employees are evacuated and accounted for. Supervisors will then join their emergency unit to cope with the emergency. Evacuation direction maps are posted in all work areas and throughout the building. Evacuation routes are outlined on the maps.

Outside aid for emergencies will be summoned by telephone by the Emergency Director or his designee. If the telephones are inoperative, the Emergency Director will dispatch an employee to a public telephone at the corner of Forbes Road and Broadway Avenue with a copy of the Emergency Services phone list to summon aid.

If an emergency occurs during 2nd or 3rd shift operations, the supervisor in charge or emergency squad member on premises will request outside emergency services by telephone. He will also notify the Emergency Director and at least one staff member of the emergency.

During the emergency, communications will be maintained between the Emergency Director by telephone, two-way radio and runners.

If an emergency occurs while the plant is unoccupied, emergency service groups will notify the Emergency Director and staff members through use of current lists including telephone numbers.

The Emergency Director will provide information to employees through their supervisors with regard to returning to work areas following an emergency.

Emergencies involving hazardous wastes and hazardous materials will be reported to the local fire department and the cognizant EPA offices. All incidents involving hazardous wastes and hazardous materials will be documented for review to insure protection of employees, work areas and the environment.

TRAINING

Training for proper response to emergencies will be provided by the Emergency Director. A log of training activities and list of trained personnel will be maintained.

All employees will receive training perinent to their emegency assignments and to assignments involving the handling of hazardous wastes and hazardous materials as detailed in the VERNITRON PIEZOELECTRIC DIVISION WASTE TRAINING PROGRAM . First aid certification and CPR certification will be received per Red Cross recommendations.

Training will include simulation of emergency procedures and use of emergency protection equipment. Audio-visual programs and lectures by trained personnel will be utilized in the training programs.

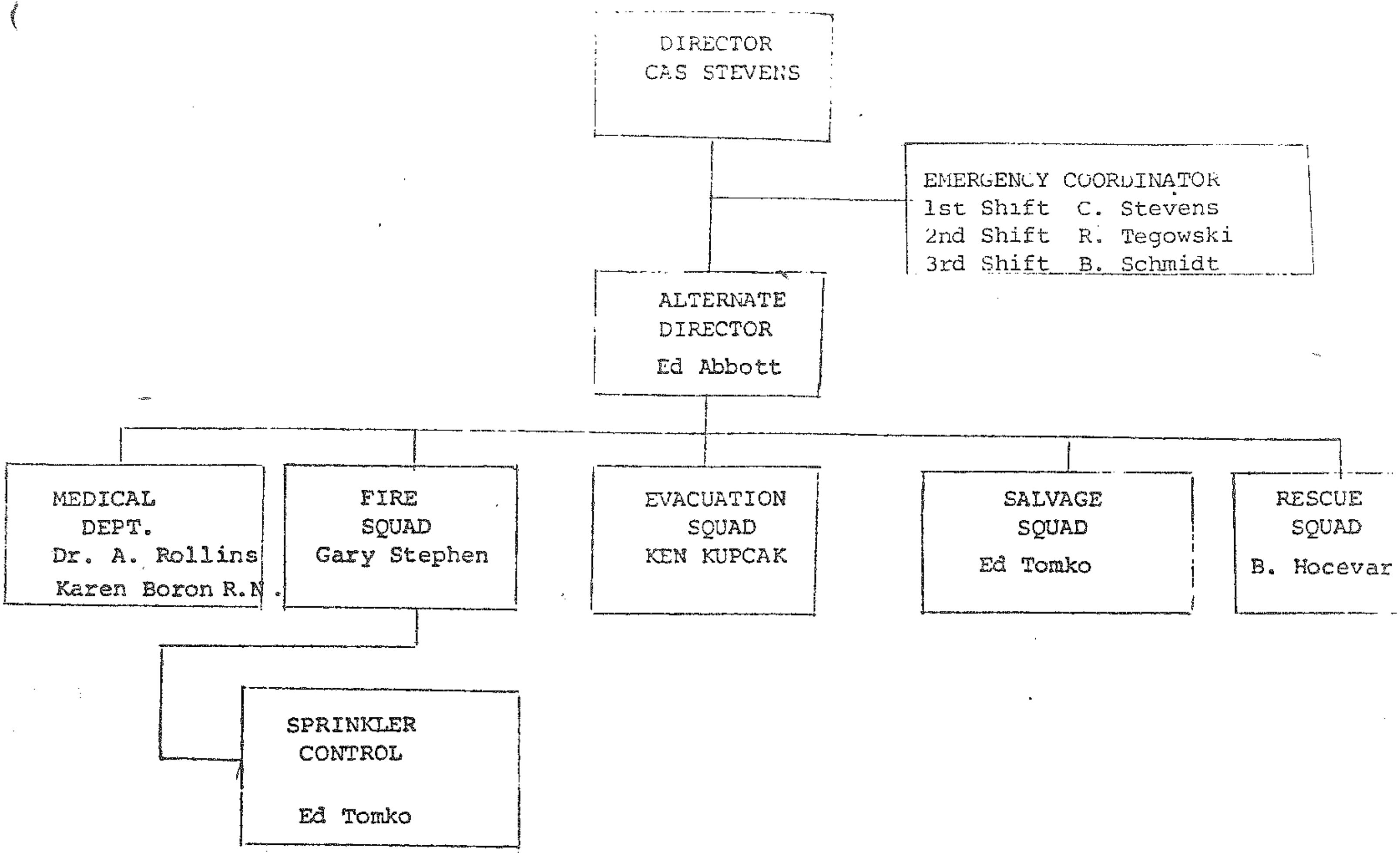
All new employees must receive information regarding their responsibilities during an emergency during the first week of their employment. Their Supervisor is responsible for reviewing emergency procedures with new employees.

Employees transferred to another shift must be informed of the shift emergency procedures by their Supervisor during the first day of transfer.

INSPECTIONS

See VERNITRON PIEZOELECTRIC DIVISION INSPECTION OF SAFETY, FIRE AND SPILL PREVENTION EQUIPMENT

EMERGENCY TEAM



Revised 12/10/86

VERNITRON PIEZOELECTRIC DIVISION

232 Forbes Road, Bedford, Ohio (216)232-8600

Fire Department	Bedford	232-1212
	Oakwood	232-1035
Police Department	Bedford	232-1234
	Oakwood	232-1035
State Police		587-4305
F.B.I.		522-1400
Bomb Squad (Cleveland Police Dept.)		623-5644
Civil Defense (Disaster Services - Cuyahoga County)		623-7298
Ambulance		232-1212
C & A Ambulance Service (hand Injury) see instruction sheet)		292-7485
Poison Center		231-4455
Medical Director		381-1514
Nurse		562-9067
Electricity (emergency)		241-6777
Gas		361-2345
Water		666-3063
Bedford Hospital		439-2000
Suburban Hospital		491-6000
E P A Hazardous Waste Emergency		1-800-282-9378
Ron Roch		232-4927
Cas Stevens		338-7671
Gary Stephen		582-2714
Ken Kupcak		524-9087
Ed Abbott		663-5969

All persons calling any emergency number should:

1. Give your name
2. Give your location, address, telephone number
3. Describe the emergency
4. Advise of any injuries
5. Descriptions of any chemicals involved in the emergency
6. DO NOT HANG UP THE TELEPHONE

Revised 6/11/84

POTENTIAL EMERGENCIES

1. Accidents to employees and visitors
2. Fires, explosions
3. Weather damage to property
4. Chemical accidents
5. Utility failures
6. Civil disturbances
7. Spills of hazardous waste materials

Revised 6/11/84

EMERGENCY TEAM MEMBERS

RESCUE SQUAD		NAME	HOME PHONE NUMBER
	(1)	Ed Abbott	[redacted]
	(2)	Ron Roch	[redacted]
	(3)	Chester Beal	[redacted]
	(4)	Ed Tomko	[redacted]
	(5)	Karen Boron, R.N.	[redacted]

Revised 12/10/86

PLANT EMERGENCY SQUAD

In order to achieve the goal of a safe work place, a Plant Emergency Committe will be established at each facility. Its organization will be as follows:

1). Chain of Command

a. Corporate Safety Supervisor - will be responsible for coordinating the efforts of the Plant Safety Committees at each facility.

b. Plant Safety Coordinators - The Plant Manager or Superintendent will be responsible for implementing the policies and procedures at the local level. The Coordinator will: appoint the members, conduct regular meetings, designate areas of priority, and report to the Corporate Safety Supervisor.

c. Plant Emergency Squad - Members will include all levels and all shifts, including key supervisory and maintenance personnel. Where applicable, union representation will also be included. All members will become thoroughly familiar with each of the insurance and safety policies and procedures.

2). Structure

a. Size - The number of members will vary with the size of the plant. As a general rule there should be at least two permanent and three rotating members for each fifty employees.

b. Permanent members - Department heads and supervisors will be appointed as permanent members and will act as the committee leaders. They will report directly to the Plant Safety Coordinator.

c. Rotating members - Experienced personnel from all departments will be assigned to the Plant Safety Committee for six-month terms. The terms should be arranged so that there is never a complete turnover in membership at one time.

d. Alternates - All rotating members will automatically become alternate members upon completion of their six-month term. Alternates may be called upon at any time to stand in for either a permanent or temporary member.

3). Duties

a. Periodic inspections - Premises and work areas will be inspected at the beginning of each week for safety hazards or any condition which endangers the health of Vernitron's employees and visitors or the protection of Vernitron's property. This SOP on Plant Safety Rules should be used as a guide for the inspections.

Members will form teams, each being responsible for a specific area. Safety violations will either be corrected on the spot or a written report will be kept and discussed at the safety committee meetings. The enclosed checklist should be used for this purpose.

b. Accident investigation - All accidents, including worker's injuries, automobile mishaps, fire, theft, etc., will be investigated and a report made to the Corporate Safety Supervisor. Investigations will also be conducted of "near miss" situations. Items of concern are:

1. Date of accident

2. Persons involved

3. Cause

4. Injuries

5. Extent of damage

6. Lost time

7. Steps taken to prevent recurrence

c. Safety meetings - The safety coordinator will call regular committee meetings on a monthly basis. Topics of discussion would include:

1. Inspection results

(a) Hazards found

(b) Hazards disposed of

(c) Hazards to be dealt with

(d) Violations of safety rules by employees and steps taken to correct employees' acts.

2. Discussion of accidents, "near misses," and investigations.

3. Training of employees

4. Instruction of committee members

The Corporate Safety Coordinator will periodically attend the meetings to lead discussions and answer questions.

d. Emergency preparedness - Each committee member will be assigned specific duties as relates to the following:

1. Communications

   (a) Sounding the general alarm

   (b) Notification of Fire and/or Police Departments

   (c) Notification of Management (local and Corporate level)

2. Fire Fighting

   (a) Manning extinguishers and hoses - Two people should attack a fire together, with one acting as a back-up for the other. All committee members will be instructed in the location and proper utilization of extinguishers and hoses.

   (b) Manning sprinkler valves - The locations of the sprinkler system valves should be clearly marked. At least one permanent member and one alternate member should be familiar with the operation of the sprinkler system including all controlling valves. When an emergency arises they should go directly to the main control valve and assure that it is open. The valve must not be shut until authorization is received from the Fire Department or the person in charge.

3. Plant Shut-Down

4. Evacuation

5. Rescue and First-Aid

6. Clean-up and Salvage

7. Restoration of Sprinkler Systems

e. Emergency Comeback - Immediately following a major accident, all available means are to be employed to expedite the return to full operation. The committee members should be familiar with the location of:

1. Specifications, plans, drawings, etc. for:

   (a) Buildings and utilities

   (b) Finished products

   (c) Machinery and equipment

   (d) Production engineering procedures

   (e) Raw materials (source of supply, delivery times, required quantities)

2. Inventory (machinery, equipment, tools, etc., raw materials, finished products)

3. Personnel records

4. Any other records which would be vital to recovery of operations.

f. Record keeping - Records will be kept of all accidents, investigations, inspections, and committee meetings. Copies of all records will be sent to the Corporate Safety Supervisor.

EMERGENCY EVACUATION & PLANT SHUT-DOWN

In the event of an emergency the following procedures are to be followed:

1). Sound the alarm to all employees.

2). Notify Fire and Police Departments.

3). Evacuate non-essential personnel.

4). Utilize all available means of controlling the fire.

5). Shut off all power to machines, fans, boilers, heating devices, etc.

6). Shut off the flow of all gas and other fuels.

7). Seal all hazardous and flammable materials and secure all storage vessels.

8). Safeguard against the escape of corrosives, pollutants, gases, and fumes.

9). Shut down ventilation systems and most lighting.

10). Close windows, doors, fire doors, etc.

11). Clear aisles.

12). Close all safes, file cabinets, closets, etc.

13). All remaining personnel must be evacuated.

14). Notify EPA Ohio of hazardous wastes involved in an emergency.

15). After emergency has passed:

a. Conduct clean-up and salvage operations

b. Segregate and inventory damaged and undamaged property

c. Expedite the return to full operation

In order to properly prepare personnel for an emergency condition, the attached "Emergency Evacuation Plan" should be distributed and posted in prominent areas.

Vernitron Piezoelectric Division
232 Forbes Road / Bedford, Ohio 44146 / (216) 232-8600

Date ______

REQUEST FOR CONSULTATION

Patient Name ______ Present Occupation ______

S. S. # ______

Referred to ______ ______ (Physician)

Reasons for Referral

✓ Diagnosis

___ Rule out

___ Recommendation of therapy

✓ Treatment

___ Determination of present/permanent disability

___ Determination of work capacity

___ Opinion as to occupational etiology

✓ Follow-up - Please refer back Dr. Rollins in cas[e] of industrial inju[ry] or illness

REMARKS:

✓ Please advise on this form

___ Please prepare formal consultation letter to: ______ Arlen J. Rollins, D.O., Medical Director

Consultant's Reply

WHEN AN EMPLOYEE IS SENT TO AN EMERGENCY ROOM, XRAY OFFICE, MEDICAL SPECIALIST OFFICE PLEASE SEND FORM H 60 ALONG WITH PATIENT. FILL OUT TOP OF FORM AND CHECK DIAGNOSIS, TREATME[NT] PLEASE ADVISE ON THIS FORM, FOLLOW UP-PLEASE REFER BACK TO DR. ROLLINS IN CASES OF INDUSTRIAL INJURY OR ILLNESS

FORM H 60 IS KEPT IN UNLOCKED FILE CABINET IN DISPENSARY

EMERGENCY EVACUATION PLAN

A. NOTIFICATION

1). During normal business hours - notify Plant Manager

2). After hours - Fire Department
Police Department
Plant Manager

B. EXTINGUISH FIRE if possible - Know the location and operation of extinguishers and hoses.

C. Be prepared to EXIT CALMLY - Know the location of all exits.

D. PRIOR TO EXITING

1). SHUT OFF ALL POWER to machines, fans, boilers, etc.

2). SHUT OFF GAS and other fuels

3). Seal all hazardous and flammable materials and secure all storage vessels.

4). Close windows, doors, fire doors, etc.

5). Clear aisles.

E. FOLLOW INSTRUCTIONS - Maintain order and quiet.

F. DO NOT INTERFERE with emergency operations.

G. After exiting MAINTAIN DISTANCE and await further instructions.

H. Above all KEEP YOUR HEAD - avoid panic and confusion.

TO BE POSTED IN THE PLANTS

BOMB THREAT PROTECTION PLAN

1). Purpose: This plan is provided to clearly define the procedures to be followed during a bomb threat. Our chief concern is the safety of our people.

2). Receiving the Call: The person receiving the call should follow the procedures specified on the enclosed "BOMB THREAT CALL CHECKLIST." He should completely fill out the form immediately after the caller has hung up. This information should be made available to the authorities.

3). Nôtification: The person receiving the call should immediately notify the Plant Manager or the person in charge. They will call the Fire Department and the Police Department. The Corporate Office should also be notified.

4). Evacuation: Fo-low the "Emergency Evacuation and Plant Shut-Down Procedures."

5). Search:

a. Supervisory personnel should inspect their respective areas for suspicious looking devices as well as anything out of the ordinary.

b. All doors, cabinets, lockers, etc. should be closed but unlocked for easy access and inspection.

c. Areas most accessible to outsiders should be searched first.

6). Bomb Location and Disposal: If a suspicious package or device is found, the following steps should be taken:

a. Do NOT touch, move, or disturb device.

b. Clear the area of all personnel.

c. Report immediately to the person in charge and to the authorities.

d. All personnel will stay away from the area until the authorities have removed the device.

7). Re-entry:

a. Personnel should begin to reenter the premises only when the area has been declared SAFE by the proper authorities.

b. All areas should be reinspected for both undiscovered devices and damage done during the inspection.

c. When plant management is satisfied that conditions are safe, operation will resume.

8). Investigation and Reporting: Immediately following resumption of operations, a comprehensive report will be prepared. All persons involved will contribute to the report which will be forwarded to the Corporate Risk Manager as well as the appropriate Corporate management personnel responsible for local operations.

BOMB THREAT CALL CHECKLIST*

If you receive a bomb threat over the telephone, you are to follow these procedures:

1) Remain calm

2) Do NOT hang up

3) Record the exact words of caller: ____________________

____

____

4) Ask these questions:

a. When is bomb supposed to go off?____________________

b. Where is bomb located?____________________

c. What kind of bomb is it?____________________

d. What does bomb look like?____________________

e. Why was bomb placed?____________________

f. Who placed the bomb?____________________

5) Description of Caller's Voice:

Male______ Female______

Adolescent________ Young________ Middle Aged________ Old________

Accent (Describe)____________________

Tone of Voice____________________

Background Voices or Noises____________________

Was Voice Familiar____If so, who did it sound like?__________

____

6) Time Call Received____________________

7) Time Caller Hung Up____________________

8) Name of Person Receiving Call____________________

9) Action Taken Afterwards____________________

____

____

* Blank copies of this form should be made available.

PROPERTY LOSS REPORTING

Whenever a fire or other physical disaster occurs, it is essential that the appropriate Corporate management personnel who are responsible for local operations are notified at once. In addition, one of the following should be contacted as soon as practical. The person contacted will then notify the others.

1) Les Welch - Office: 516-775-8200
   Home: [redacted]

2) Sentry Insurance Company

   Dan Rosenberg - Office: 516-694-0606
   Home: [redacted]

In delivering the initial report of loss, the following information should be given:

1) Exact location of loss.

2) Nature of loss (fire, explosion, earthquake, etc)

3) Estimated extent of loss.

4) Present status (under control, extinguished, etc)

5) Bodily injury.

6) Who else was contacted.

7) Your name and position title.

8) Number where you can be reached.

9) Local weather conditions.

As soon as practical after the emergency has passed, an investigation should be conducted as to the cause and extend of the loss, and a follow-up written report should be prepared and sent to the Corporate Risk Manager.

OSHA COMPLIANCE

The Occupational Safety and Health Act of 1970 has established many volumes of standards and regulations governing the safe operation of this nation's industrial concerns. These standards are of such a varied and detailed nature that it would be impractical for us to reproduce each one that may apply to Vernitron's operations. Generally speaking, however, the policies and procedures contained herein will provide the basis for compliance if they are followed and adhered to diligently.

In reducing these policies and procedures to writing and in striving toward our stated goal of providing a safe work place for our employees, we are exhibiting a "good faith" effort which will weigh favorably with an OSHA inspector.

The Plant Safety Committee members, under the direction of plant management, will be responsible for assuring that these policies and procedures are followed and that each employee is cognizant of Vernitron's safety policy.

INJURIES TO VISITORS

If anyone other than an employee suffers bodily injury or property damage on any Vernitron property, the following steps should be taken by the Medical Department or Staff Manager in charge:

1) Procure ambulance or drive visitor to hospital or obtain medical assistance if necessary. Contact Dr. Rollins.

2) Obtain all available information concerning the injured party, property involved, nature of injury, cause of injury, witnesses to accident, etc. Submit a complete accident report to the Safety Director.

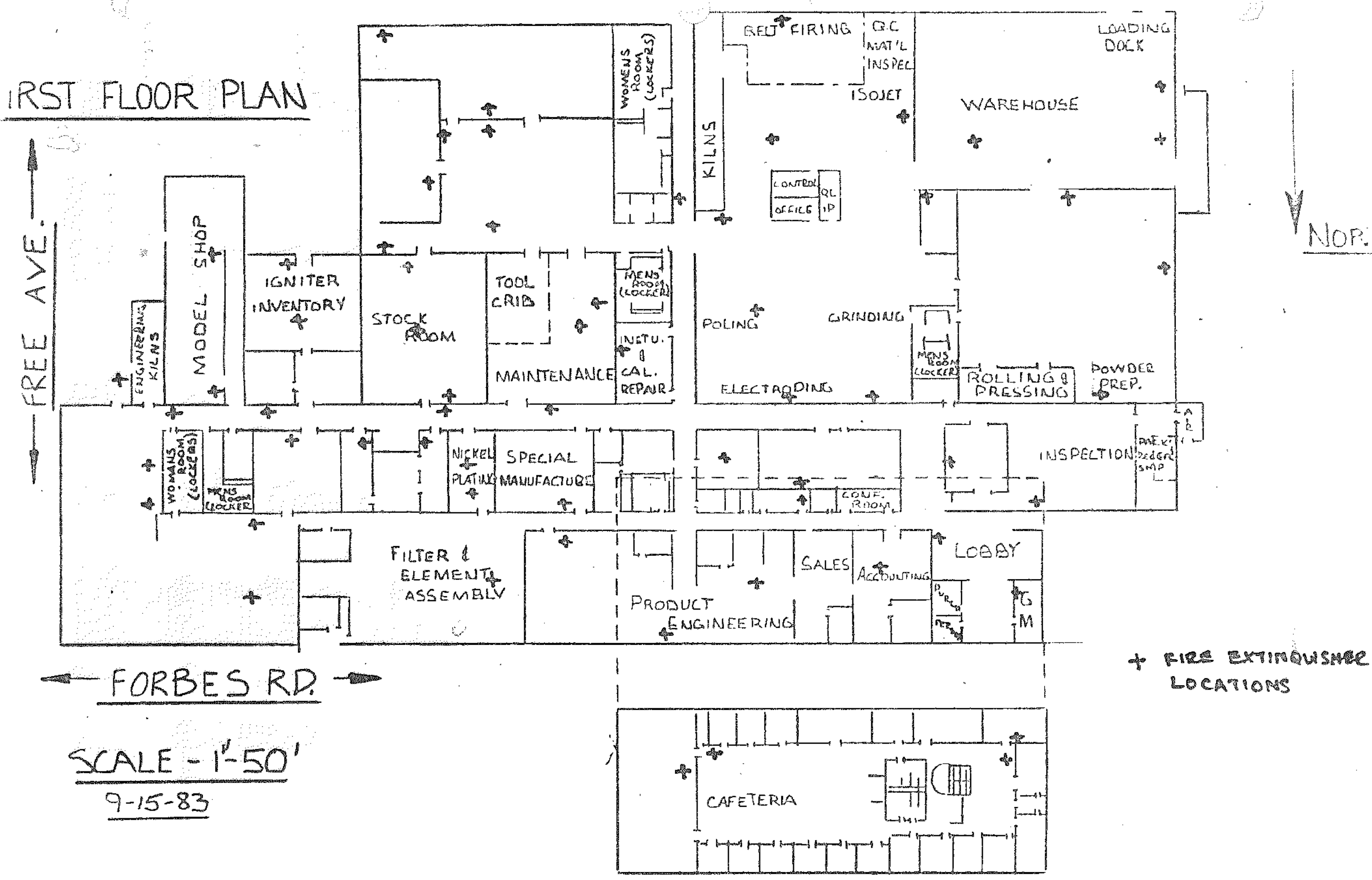
3) Notify Director of Risk Management immediately.

4) Do not discuss the accident with any outside party other than Vernitron's insurance company's representatives.

5) Do not admit negligence or offer to pay damages without proper authorization from the insurance company.

6) Send copies of all documents, correspondence, etc. to the Director of Risk Management.

IRST FLOOR PLAN



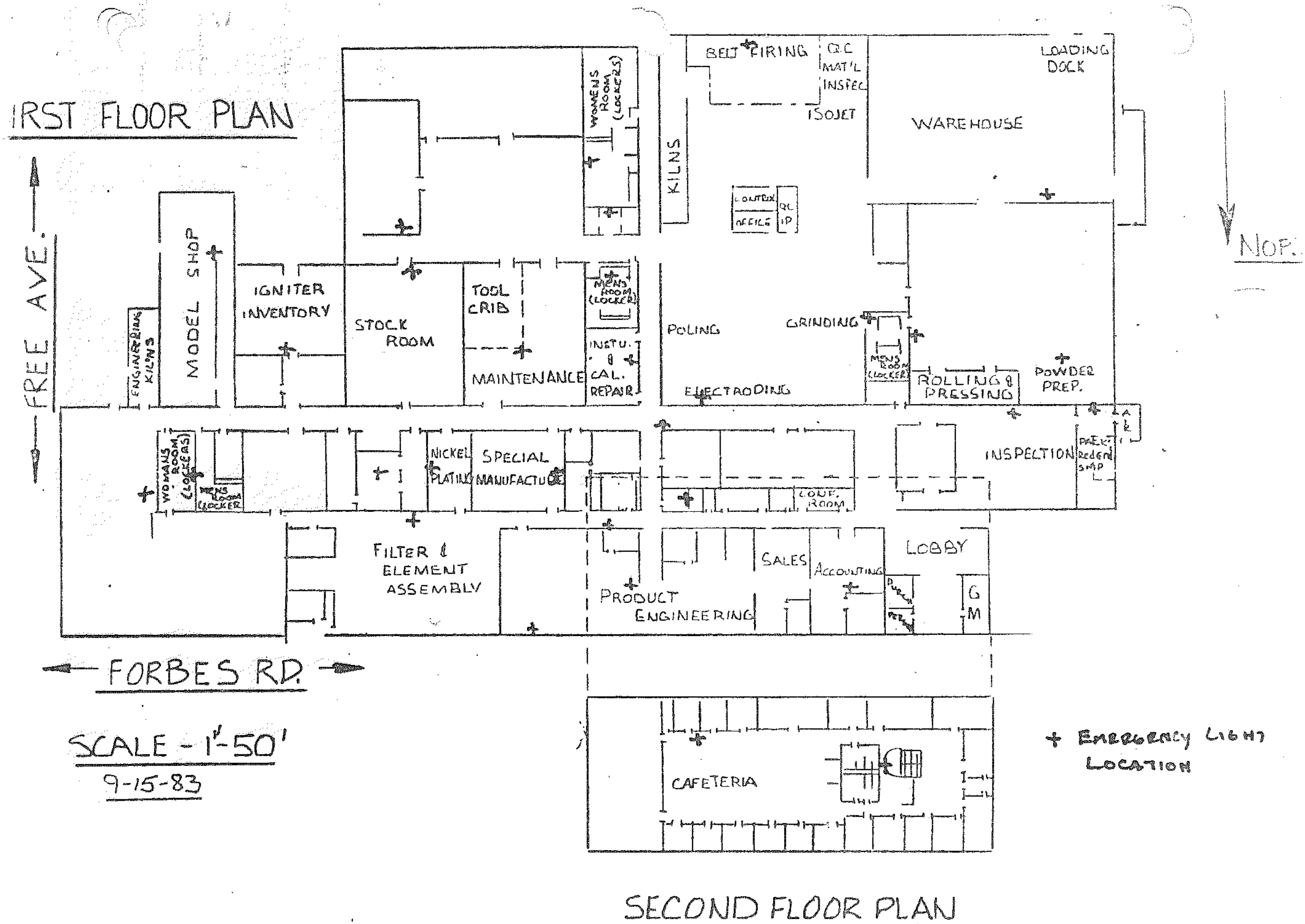
SCALE - 1"-50'

9-15-83

SECOND FLOOR PLAN

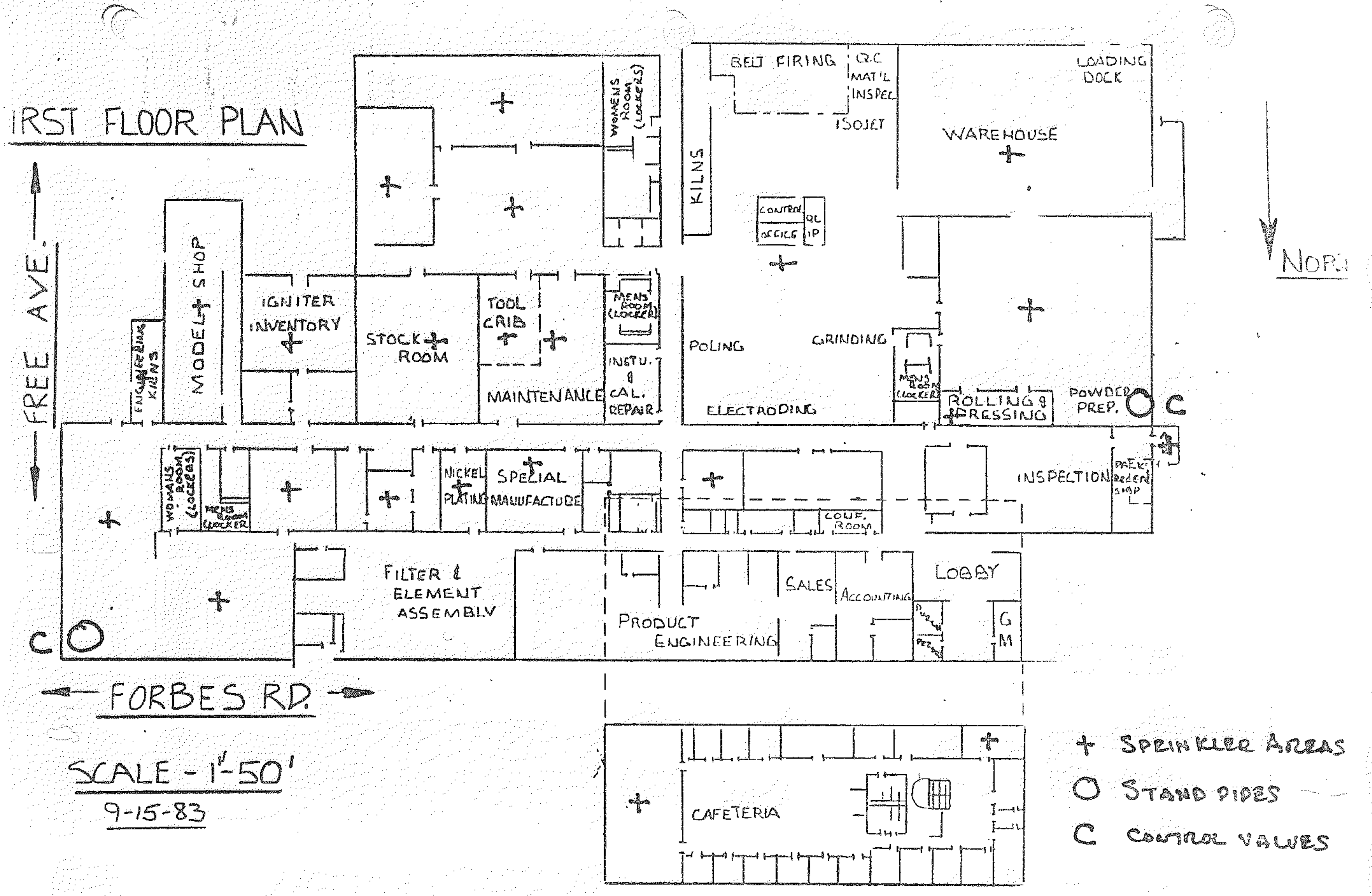
VERNITRON PIEZOELECTRIC DIVISION

L.W.L



VERNITRON PIEZOELECTRIC DIVISION

L.W.L.



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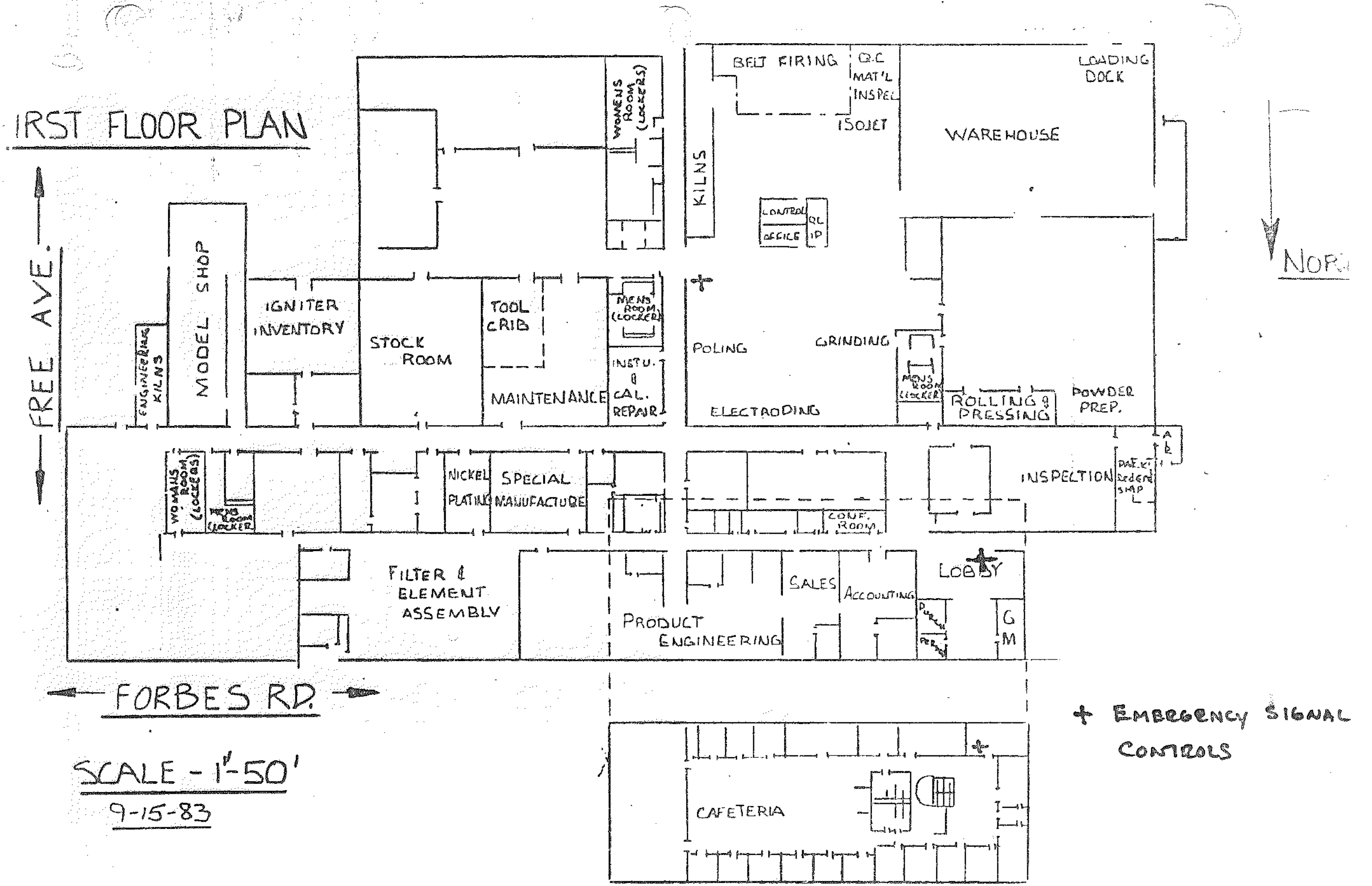
VERNITRON PIEZOELECTRIC DIVISION

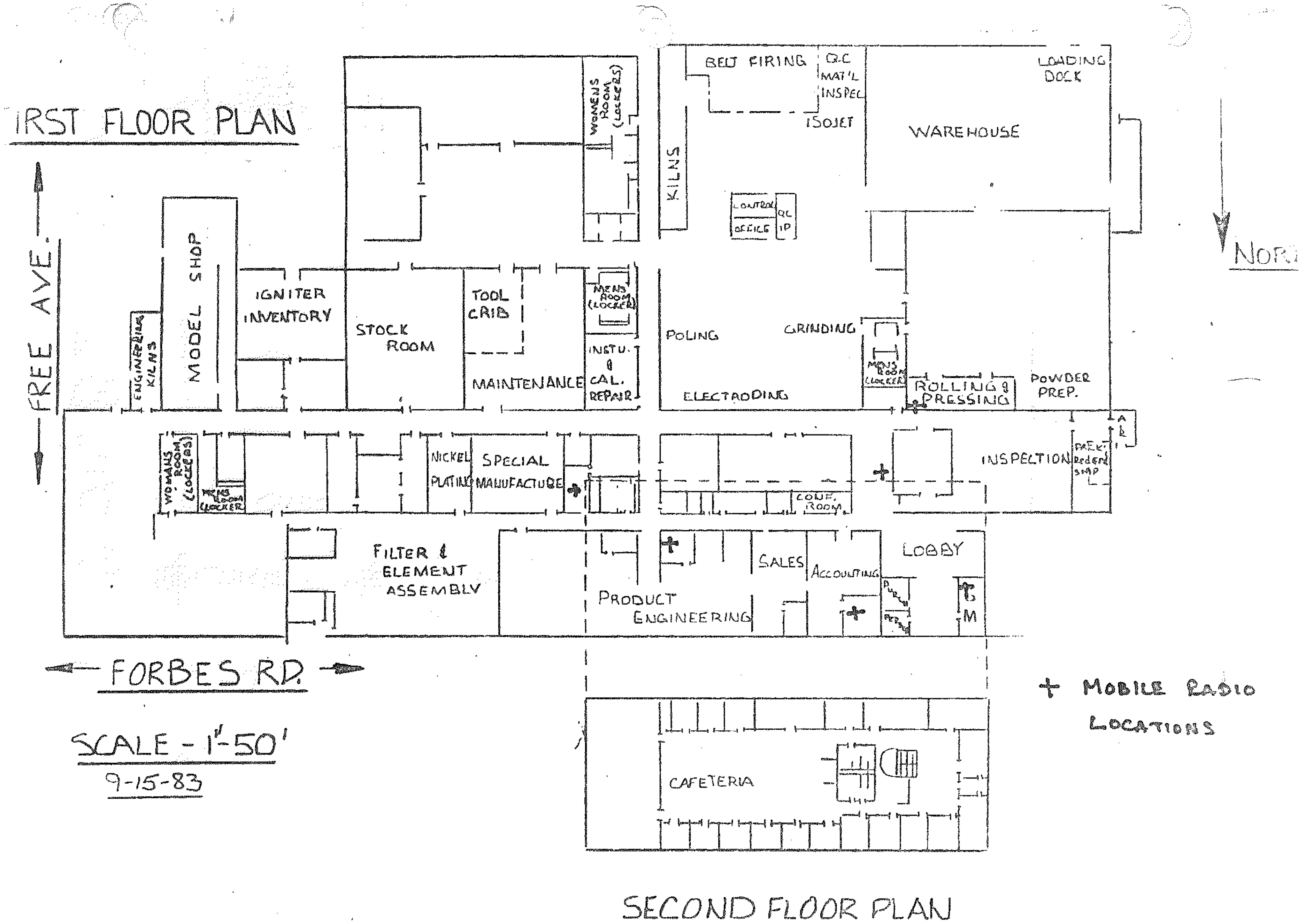
L.W.L



SECOND FLOOR PLAN

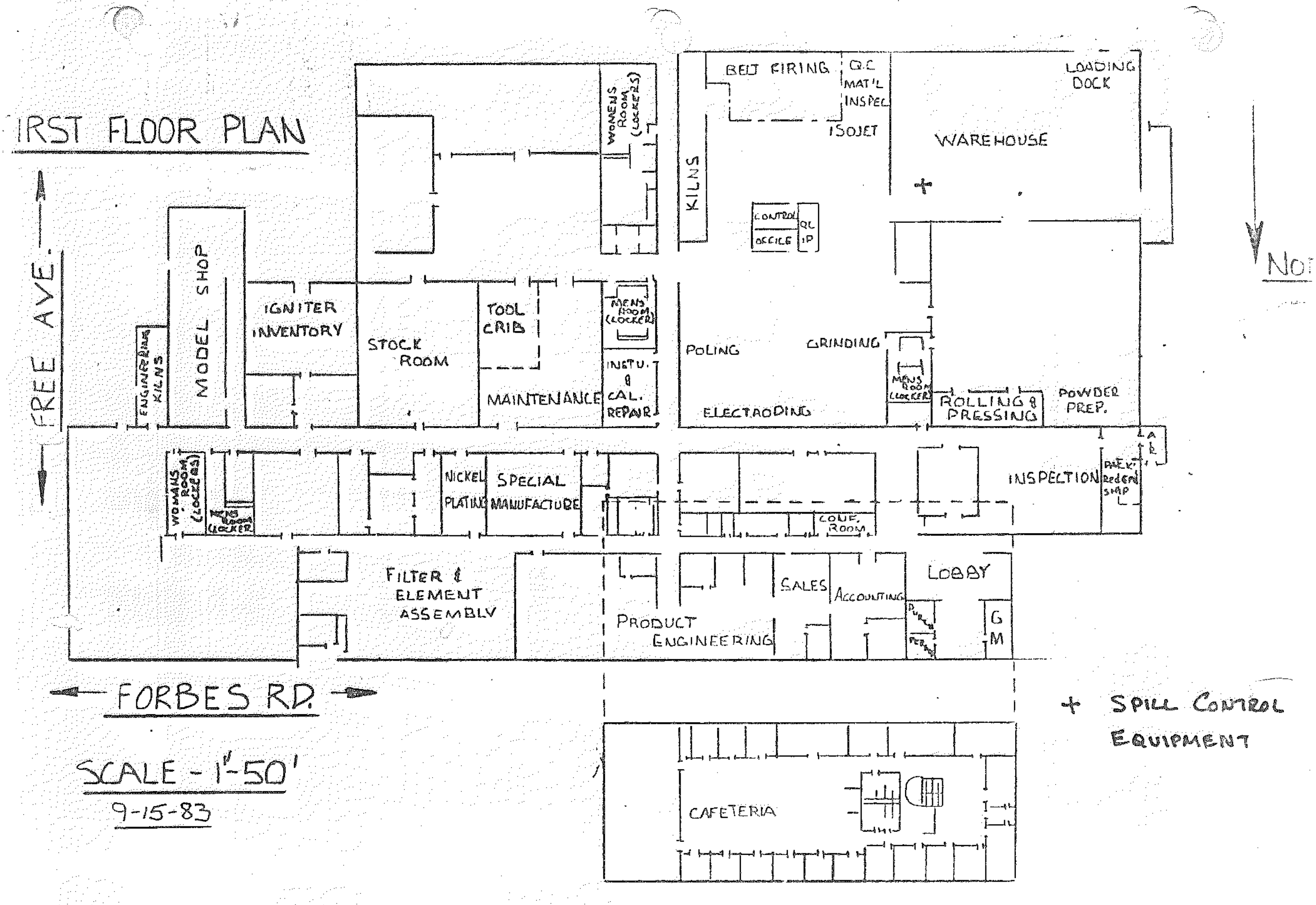
VERNITRON PIEZOELECTRIC DIVISION

L.W.L



VERNITRON PIEZOELECTRIC DIVISION

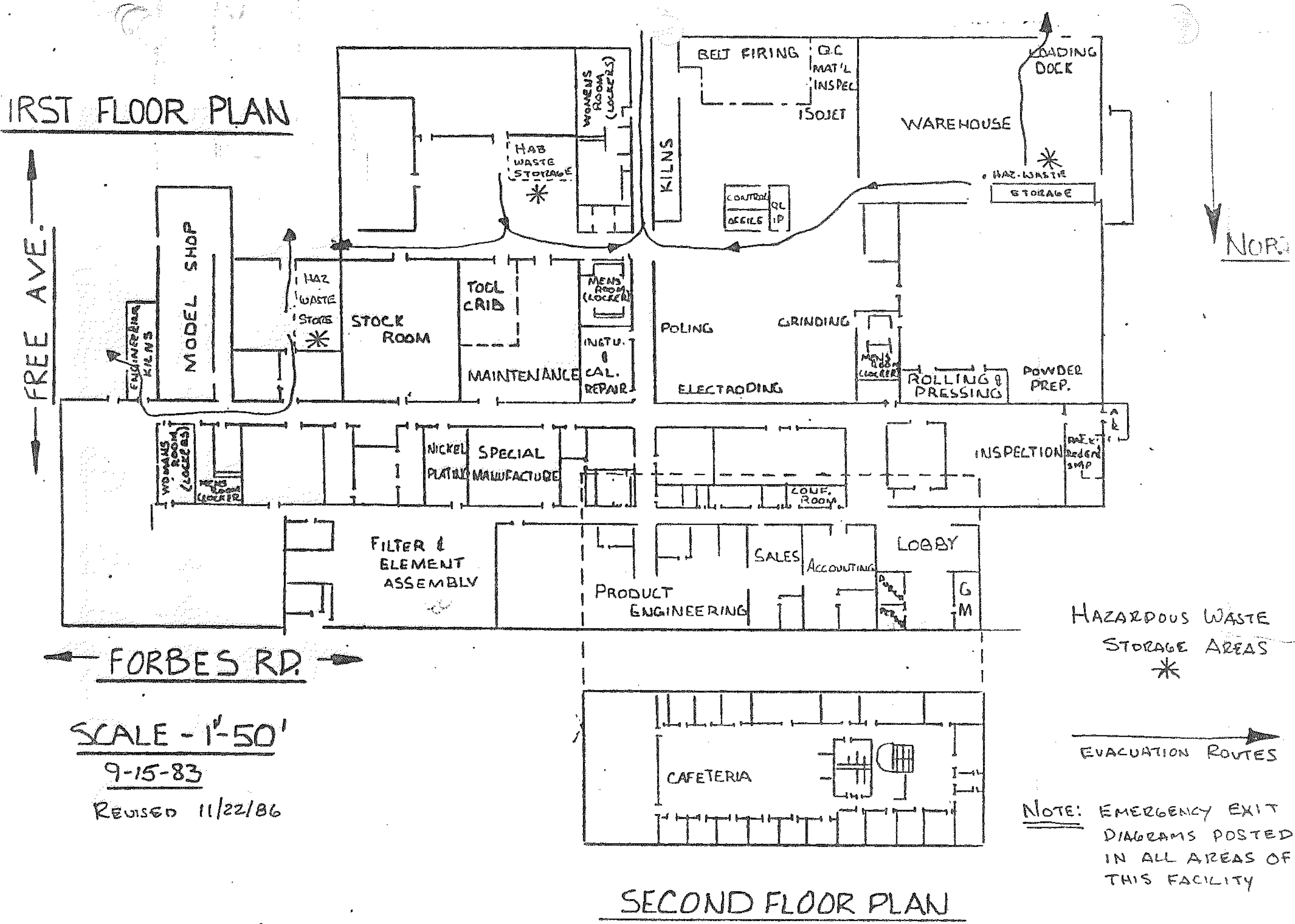
LWL



SECOND FLOOR PLAN

VERNITRON PIEZOELECTRIC DIVISION

L.W.L.



HAZARDOUS WASTE STORAGE AREAS *

EVACUATION ROUTES

SCALE - 1"-50'

9-15-83

REVISED 11/22/86

NOTE: EMERGENCY EXIT DIAGRAMS POSTED IN ALL AREAS OF THIS FACILITY

VERNITRON PIEZOELECTRIC DIVISION

L.W.L

CONTINGENCY PLAN - AMENDMENTS

Fire Fighting Equipment

The fire fighting equipment at Vernitron Piezoelectric consists of an automatically operated sprinkler system (see map identifying sprinkler protected areas) and a distribution of CO_2 and chemical powder fire extinguishers (see map detailing the location of fire extinguishers). This equipment is intended for emergency use only. The primary fire fighting activity is to be performed by the Bedford - Oakwood Fire Departments.

Activation of the sprinkler system automatically notifies the Bedford - Oakwood Fire Departments through a service supplied by Honeywell Protection Service. All other fire fighting requirements are requested by telephone notification. The emergency phone numbers are posted throughout the facility on every telephone directory.

Hazardous Waste Spill Equipment

Equipment for controlling hazardous wastes are primarily dry absorbant inert materials for liquids and an OSHA approved vacuum sweeper for dry solids. A wet floor scrubber is also used for the cleaning of spills of hazardous wastes associated with ceramic wastes.

The Safety Director is to be notified of all hazardous material spills to insure that spills are contained safely and cleaned up safely. The Safety Director is responsible for prompt notification of authorities as required by current EPA and RCRA regulations to insure the spills properly and safely contained and cleaned up.

In addition to the Safety Director, emergency coordinators on the second and third shifts are responsible for the immediate notification of the Safety Director or alternate directors, in the event of a spill of hazardous wastes (see emergency team).

(D) If the emergency coordinator determines that the facility has had a release, fire, or explosion which could threaten human health, or the environment, outside the facility, he shall report his findings as follows:

(1) If his assessment indicates that evacuation of local areas may be advisable, he shall immediately notify appropriate local authorities. The emergency coordinator shall be available to help appropriate officials decide whether local areas should be evacuated; and

(2) The emergency coordinator shall immediately notify the Ohio EPA emergency response team by use of its twenty-four-hour toll free telephone [redacted] - 1-800-282-9378 and provide the following information:

(a) Name and telephone number of reporter;

(b) Name and address of facility;

(c) Time and type of incident (e.g., release, fire);

(d) Name and quantity of materials(s) involved, to the extent known;

(e) The extent of injuries, if any; and

(f) The possible hazards to human health, or the environment inside and outside the facility.

(E) During an emergency, the emergency coordinator shall take all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur, or spread to other hazardous waste at the facility. These measures shall include, where applicable, stopping processes and operations, collecting and containing released waste, and removing or isolating containers.

(F) If the facility stops operations in response to a fire, explosion, or release, the emergency coordinator shall monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, wherever this is appropriate.

(G) Immediately after an emergency, the emergency coordinator shall provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.

(H) The emergency coordinator shall ensure that, in the affected area(s) of the facility:

(1) No waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed; and

(2) All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed.

(I) The owner or operator shall notify the director and appropriate local authorities that the facility is in compliance with paragraph (H) of this rule before operations are resumed in the affected area(s) of the facility.

(J) The owner or operator shall note in the operating record the time, date, and details of any incident that requires implementing the contingency plan. Within fifteen days after the incident, the owner or operator shall submit a written report on the incident to the director. The report shall include:

(1) Name, address, and telephone number of the owner or operator;

(2) Name, address, and telephone number of the facility;

(3) Date, time, and type of incident (e.g., fire, explosion);

(4) Name and quantity of material(s) involved;

(5) The extent of injuries, if any;

(6) An assessment of actual or potential hazards to human health or the environment, where this is applicable;

(7) Estimated quantity and disposition of recovered material that resulted from the incident; and

(8) Any other information as the director may require.

Toxcon Engineering Company, Inc.

REPORT OF

PARTIAL CLOSURE PROJECT

for

VERNITRON PIEZOELECTRIC DIVISION
232 Forbes Road
Bedford, Ohio 44146

October 31, 1988

Prepared By:

Toxcon Engineering Company, Inc.
3334 Richmond Avenue, Suite #200
Houston, Texas 77098
713-520-7667

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ATTACHMENTS

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INTRODUCTION

During the week of August 22, 1988, partial closure efforts were implemented at the Vernitron Piezoelectric Division (Vernitron) Site in Bedford, Ohio. This effort included on-site clean-up to eliminate potentially hazardous materials and verification sampling to evaluate the effectiveness of the clean-up. This report documents the details of the on-site clean-up and verification sampling, and reports the analytical results of the verification samples collected. In addition, follow-up clean-up efforts directed toward bringing the site to clean closure are proposed.

Clean-up and verification sampling proceeded according to guidelines outlined in Vernitron's December 15, 1986 Partial Closure Plan, as approved and modified by Ohio E.P.A. in their May 7, 1987 letter to Vernitron, and approved by U.S.E.P.A. in their June 9, 1988 letter to Vernitron. As clean-up efforts progressed, some on-site modifications to the approved plans were determined to be necessary and appropriate, and were implemented. Gregory Taylor, Environmental Scientist of Ohio E.P.A., agreed to the modifications.

Toxcon Engineering Company (Toxcon) was retained by Vernitron to manage the clean-up efforts at the Vernitron Piezoelectric Division Site.

INSIDE STORAGE AREA

The inside storage area is the area where waste products known to contain tetrachloroethene and lead were stored in drums. The drums were either stored directly on the concrete floor or on pallets. All drums were sent for disposal or recycling prior to the August 22, 1988 clean-up of this area. The location of the inside storage area is shown on Figure 1.

Clean-Up

The vacated concrete area was scrubbed with soap and water and rinsed with clean tap water three times using brooms. After each cleaning, the waste wash water and rinse water were collected in shop-vacs and transferred for disposal into 55 gallon drums. In order to evaluate the effectiveness of this clean-up effort, verification samples were collected from the pavement rinse water per the Partial Closure Plan.

Sampling

The location of the verification sampling point was selected in accordance with E.P.A.'s SW-846 recommended statistical sampling methods. After completion of the clean-up, the inside storage area was divided into a grid of fifty-four, 2 feet by 4 feet rectangles. One rectangle of the grid was randomly selected for verification sampling. This sampling location is shown on Figure 2. The grid used to randomly select the sampling point is attached in Appendix B.

The verification sampling location was surrounded by an oil absorbent. Distilled water was poured onto the concrete and allowed to saturate the surface. After approximately 1 minute, the distilled water was aspirated and placed in sampling containers. The containers were sealed, labeled, and stored on ice until analyzed.

Since the materials that had been stored in this area were known to contain tetrachloroethene and lead, the samples were analyzed according to methods that would detect these contaminants. In order to determine if levels of organic compounds were present, one sample (No. 6) was analyzed to determine the levels of volatile and semi-volatile organics in the sample using E.P.A.'s SW-846 Analytical Methods 8010 and 8020. In order to determine if elevated levels of metals were present, one sample (No. 5) was analyzed to determine the levels of the eight EP toxicity metals listed in 40 CFR 261.24.

The samples were taken to Wadsworth/Alert Laboratories, Inc. in Cleveland, Ohio for analyses. Wadsworth/Alert analyzed the samples using E.P.A. methods and protocols, as required by the Ohio E.P.A. and the U.S.E.P.A. Sample chain-of-custody was maintained.

Analytical Results

Sample No. 6 was found to contain no RCRA-regulated solvents in concentrations greater than 1 mg/l, and Sample No. 5 contained no metals in concentrations greater than their respective allowable maximum concentrations of EP Toxicity according to 40 CFR 261.24 guidelines. The Certified Laboratory Results are contained in Appendix A and detectable constituents are summarized and presented on Figure 2.

The results of the laboratory analyses of these verification samples indicate the inside storage area has been brought to clean closure in accordance with the Ohio E.P.A. and U.S.E.P.A. approved closure plan. Therefore, no further remediation of the inside storage area is necessary.

OUTSIDE STORAGE AREA

The outside storage area was used to store drums of wastes containing spent tetrachloroethene and lead materials. The materials were stored in drums, placed on pallets, and set on the asphalt surface. All drums were sent for disposal or recycling prior to the August 1988 clean-up of this area. The location of the outside storage area is shown on Figure 1.

Clean-Up: Asphalt Removal

The uncovered pavement showed signs of surface corrosion. Therefore, the asphalt pavement was first scraped and swept to remove loose asphalt fragments. The material collected was placed on visqueen in an area designated as the excavated soils pile. The location of this pile is shown on Figures 3 and 4.

After sweeping and scraping of the asphalt pavement, the general condition of the asphalt pavement was assessed. Due to the extent of visible corrosion and staining on the surface of some of the pavement, the decision to remove a portion of the pavement was made. The asphalt pavement pieces that were removed were piled in an area designated as the excavated asphalt pile. The pile was placed on top of a visqueen liner and another visqueen liner was used to cover the pile. The locations of the areas where the asphalt pavement was removed and later stored are shown on Figures 3 and 4.

After the pavement was removed, portions of the soils below the pavement were observed to be stained. It was decided that these stained soils should be excavated to insure the area was cleaned. Soils were excavated until all indications of staining were gone. In some areas, soils were excavated to a depth of 1 foot. Soils were also excavated for an additional one foot laterally and vertically beyond the west and south edges of the pavement to insure that any waste that may have run off of the pavement and onto the soils was removed.

Sampling: Asphalt Removal Area

After soils excavation was believed to be complete, two verification samples were collected from the areas where corroded asphalt had been removed. The sampling locations selected were not statistically derived, but were selected as those that would be expected to contain the most elevated levels of suspected contaminants, if any remained. This sampling method was recommended by Greg Taylor of the Ohio EPA.

One sample (No. 22) was collected in an area where tetrachloroethene had been stored. This sample was analyzed to determine the levels of volatile and semi-volatile organic compounds in the sample using E.P.A.'s SW-846 Analytical Method 8240. One other soil sample (No. 24) was collected in an area where lead compounds had been stored. In order to determine if elevated levels of metals were present, this sample was analyzed for total concentrations of the eight EP toxicity metals listed in 40 CFR 261.24. Both samples were sealed, labeled, and stored on ice until analyzed. The locations of these soil sampling points are shown on Figures 3 and 4.

All of the samples were taken to Wadsworth/Alert Laboratories, Inc. in Cleveland, Ohio for analyses. Wadsworth/Alert analyzed the samples using E.P.A. methods and protocols, as required by the Ohio E.P.A. and the U.S.E.P.A. Sample chain-of-custody was maintained.

Clean-Up: Asphalt Remaining-In-Place Area

The asphalt pavement that was left in place was determined to be competent and worth salvaging. These asphalt areas were scrubbed with soap and water and rinsed with clean tap water three times using brooms. After each cleaning, the waste wash water and rinse water were collected in shop-vacs and transferred to 55 gallon drums for disposal. In order to evaluate the effectiveness of this clean-up effort, verification samples were collected for laboratory analysis.

Sampling: Asphalt Remaining-In-Place Area

The location of the verification sampling point was selected in accordance with E.P.A.'s SW-846 recommended statistical sampling methods. After completion of the clean-up, the outside storage area was divided into a grid of 37 rectangles of 50 square feet each. One rectangle was randomly selected for verification sampling. This sampling location is in the area of Sample Numbers 19 and 20 shown on Figures 3 and 4. The grid is attached in Appendix B.

The verification sampling location was surrounded by an oil absorbent. Distilled water was poured onto the surface to saturate the surface. After approximately 1 minute, the distilled water was aspirated and placed in sample containers. The containers were sealed, labeled, and stored on ice until analyzed.

Since the materials that had been stored in this area were known to contain tetrachloroethene and lead, the samples were analyzed according to methods that would detect these contaminants. In order to detect levels of organic compounds, one sample was analyzed to determine the levels of volatile and semi-volatile organics in the sample using E.P.A.'s SW-846 Analytical Methods 8010 and 8020, respectively. In order to determine if elevated levels of metals were present, one sample was analyzed to determine the level of the eight EP toxicity metals listed in 40 CFR 261.24.

All of the samples were taken to Wadsworth/Alert Laboratories, Inc. in Cleveland, Ohio for analyses. Wadsworth/Alert analyzed the samples using E.P.A. methods and protocols, as required by the Ohio E.P.A. and the U.S.E.P.A. Sample chain-of-custody was maintained.

Analytical Results

Methylene chloride was found to be present in verification Sample No. 19 collected from the cleaned pavement grid in a concentration of 1.5 mg/l. Verification Sample No. 20 was found to contain an EP Toxicity Lead concentration of 7.5 mg/l. The Certified Laboratory Results are contained in Appendix A and are summarized and presented on Figures 3 and 4.

Soil Sample No. 22, collected from the organic compound storage area where pavement had been removed, was found to contain 2700 mg/l tetrachloroethene. Soil Sample No. 24, collected from the lead storage area where pavement had been removed, was found to contain a cadmium concentration exceeding two standard deviations of the average background level detected (background level determination is discussed further in the next section). The Certified Laboratory Results are contained in Appendix A and are summarized and presented on Figures 3 and 4.

The results of the laboratory analyses of all of these verification samples indicate the outside storage area has not been brought to clean closure in accordance with the Ohio E.P.A. and U.S.E.P.A. approved closure plan. Therefore, further remediation of the outside storage asphalt paved area is necessary.

SOILS INVESTIGATION AREA

A soils investigation was conducted in the areas south and west of the outside storage area. The objective of the investigation was to determine if elevated levels of organic compounds or metals are present in the soils surrounding the outside storage area due to storage activities that have occurred in the past at the outside storage area. The soils investigation was extended to include background sampling locations away from the area of concern. The locations of the soils investigation area and the background sampling areas are shown on Figure 3 and 4.

Sampling

Five soil locations were sampled along the west and south edges of the outside storage area. The samples were collected 2 feet away from the edge of the pavement. The sampling containers were sealed, labeled, and stored on ice until analyzed. The locations of these sampling points are shown on Figures 3 and 4 (Sample Numbers 7 through 16).

Since the materials that had been stored in the outside storage area were known to contain tetrachloroethene and lead, soil samples collected in the vicinity of the outside storage area were analyzed according to methods that would detect these contaminants. In order to detect levels of organic compounds, five samples were analyzed to determine the levels of volatile and semi-volatile organics in the sample using E.P.A.'s SW-846 Analytical Method 8240. In order to determine if elevated levels of metals were present, five samples were analyzed to determine the total concentrations of the eight EP Toxicity metals listed in 40 CFR 261.24.

Background Sampling

Since metals are some of the target analytes in the samples, and metals often occur naturally in soils, four soil samples representing native conditions were collected to determine the background levels of metals. The four samples were collected 50 feet west of the former storage area fence line. This area was selected because no materials had ever been spilled or leaked here. The locations of these sampling locations are shown on Figures 3 and 4 (Sample Numbers 1 through 4).

The four background samples were analyzed only for total concentrations of the eight EP Toxicity metals listed in 40 CFR 261.24.

All of the samples were taken to Wadsworth/Alert Laboratories, Inc. in Cleveland, Ohio for analyses. Wadsworth/Alert analyzed the samples using E.P.A. methods and protocols, as required by the Ohio E.P.A. and the U.S.E.P.A. Sample chain-of-custody was maintained.

Analytical Results

Of the five samples (Samples 8, 10, 12, 14, and 16) collected in the vicinity of the outside storage area, four were found to contain RCRA-regulated solvents in concentrations greater than 1 mg/l. Tetrachloroethene was found to be present in concentrations ranging from 3 to 8 mg/l. The Certified Laboratory Results are attached in Appendix A and are summarized and presented on Figure 3.

The analytical results from Samples 7, 9, 11, 13, and 15 collected in the vicinity of the outside storage area, were compared to the background data to determine if the levels of metals detected in these samples are elevated relative to background conditions. In accordance with Ohio E.P.A. and U.S.E.P.A. guidelines, the levels of metals detected would be considered elevated if the detected level exceeded the average of the background samples plus two standard deviations. The Certified Laboratory Results are attached in Appendix A and presented and summarized on Figure 4.

The average and standard deviation for each total metal concentration were calculated for the four background samples collected. The detected levels and the corresponding averages and two standard deviation levels are presented in Table 2.

When compared with the background levels, at least one metal is considered elevated at four of the five locations sampled. These are the same four locations where samples collected were found to contain RCRA-regulated solvents in concentrations greater than 1 mg/l. The total metal levels detected in each of the samples collected in the soil area surrounding the outside storage area are presented in Table 3.

The results of the laboratory analyses of the soil verification samples indicate the soil areas in the vicinity of the outside storage area do not meet the clean closure standards of the Ohio E.P.A. and U.S.E.P.A. approved closure plan in the areas of at least four of the five sampled. Therefore, remediation of the soil areas in the vicinity of the outside storage area is necessary.

WASTE CHARACTERIZATION

Three types of waste were generated during the clean-up. This section discusses the characterization of these wastes.

Excavated Asphalt Pile

Asphalt from the outside waste storage area was removed due to visible deterioration and surface stains. Samples of the asphalt were collected to determine if the asphalt contained elevated levels of organic compounds and/or metals. This data is needed to determine how to properly dispose of the excavated asphalt.

Samples of the asphalt were not collected statistically, but were collected to represent areas most likely to contain elevated levels of lead and organics. The samples were collected from the same location as the soil verification samples that were discussed in the Outside Storage Area section of this report. As with the soil sampling, one sample was analyzed to determine the levels of volatile and semi-volatile organics present in the sample using E.P.A.'s SW-846 Analytical Method 8240 (Sample 21) and one sample was analyzed to determine the levels of metals present by analyzing for the eight EP Toxicity metals listed in 40 CFR 261.24 (Sample 23). The locations of these samples are shown on Figures 3 and 4.

The asphalt sample analyzed for organic compounds was found to contain RCRA-regulated solvents tetrachloroethene and trans-1,2-dichloroethene in concentrations of 6 mg/kg and 3 mg/kg, respectively. The asphalt sample analyzed for the eight EP

Toxicity metals was found to contain levels less than those considered to be hazardous as set forth in 40 CFR 261 Subpart C. The Certified Laboratory Results are attached in Appendix A, and the results are summarized and presented on Figures 3 and 4.

A waste classification is required from Ohio EPA in order to properly dispose of the asphalt.

Excavated Soils Pile

Soils excavated from the area around, and debris removed from the surface of, the outside storage area were collected in the excavated soils pile. The sampling location was selected in accordance with E.P.A.'s SW-846 recommended statistical sampling methods. Sample No. 18 was analyzed to determine the levels of volatile and semi-volatile organics present using E.P.A.'s SW-846 Analytical Method 8240 and Sample No. 17 was analyzed to determine the leachable levels of the eight EP Toxicity metals present with respect to 40 CFR 261.24 guidelines.

Sample Nos. 17 and 18 were found to contain tetrachloroethene in a concentration of 24 mg/kg and EP toxicity lead of 43 mg/l, respectively. Since the EP toxicity lead level is greater than 5 mg/l, the waste is considered to be hazardous for disposal purposes. The Certified Laboratory Results are attached in Appendix A and summarized and presented in Figures 3 and 4.

Waste Rinseate

Wash and rinse waters from pavement clean-up areas were randomly sampled in order to determine the appropriate mode of disposal. The sampling was performed in accordance with E.P.A.'s SW-846 recommended statistical sampling methods. The samples were analyzed to determine the levels of volatile and semi-volatile organics present using E.P.A.'s SW-846 Analytical Methods 8010 and 8020 (Sample 26), and to determine the levels of EP Toxicity metals present with respect to 40 CFR 261.24 guidelines (Sample 27).

Sample No. 26 was found to contain less than 1 mg/l of total organics and Sample No. 27 contained 110 mg/l of lead. Since the lead level is greater than 5 mg/l, the rinseate is considered hazardous for disposal purposes. The Certified Laboratory Results are attached in Appendix A and are summarized and presented on Figures 3 and 4.

CONCLUSIONS AND RECOMMENDATIONS

- **Inside Storage Area**

  This area has been brought to clean closure. No further remediation efforts are necessary.

- **Outside Storage Area Pavement**

  The asphalt left in place was found to contain elevated levels of metals and organics. The asphalt should be cleaned again using the same procedures used in the August, 1988 clean-up effort. Verification samples should again be collected to evaluate the effectiveness of the clean-up efforts.

  The soils at Sample Points 24 and 22 were found to contain elevated levels of metals and organics, respectively. A soils investigation should be performed to determine the vertical and lateral extent of these contaminants in the soils.

- **Soils Investigation Area**

  The soils area samples were found to contain elevated levels of metals and organics. A soils investigation should be implemented to determine the vertical and lateral extent of contaminants contained in these soils.

- **Wastes**

  The excavated soil pile is hazardous and should be disposed accordingly.

  A waste classification for the excavated asphalt pile should be obtained from the Ohio EPA. The excavated asphalt should then be disposed accordingly.

  The waste rinseate contains elevated levels of lead. It should be recycled with the currently generated waste by-product stream.

PROPOSED FOLLOW-UP CLEAN-UP EFFORTS

Vernitron Piezoeletric Division proposes to implement the following clean-up and investigative efforts in order to bring the outside storage and surrounding soils areas towards clean closure:

- **Outside Storage Area Pavement**

  The asphalt will be cleaned again using the same procedures used in the August, 1988 clean-up effort. Verification samples will again be collected and analyzed for total metal concentrations and tetrachloroethene (TCE) concentration to evaluate the effectiveness of the clean-up.

  The soils in the southwest portion of the excavated asphalt area, in the area of Sample No. 24, will be investigated further since the cadmium level of 4.9 mg/kg is above the background comparison value of 2.2 mg/kg cadmium. Four 3-foot borings located five feet away from Sampling Location Number 24 will be sampled in the following intervals: 1 foot, 2 feet, 3 feet. The samples will be analyzed by stratum for total metal concentrations of cadmium. This data will provide information as to the depth and extent of excavation required to remove elevated levels of cadmium. Upon receipt and interpretation of all of the analytical results, an appropriate closure plan will be designed and submitted to Ohio E.P.A. for approval. The recommended supplemental soils investigation sample locations are shown in Figure 5.

The soils in the northern portion of the excavated asphalt area, in the area of Sample No. 22, will be investigated further since the detected tetrachloroethane (TCE) level of 2,700 mg/kg is considered elevated. Four 3-foot borings located five feet away from Sampling Location Number 22 will be sampled in the following intervals: 1 foot, 2 feet, 3 feet. All of the samples will be analyzed for TCE. This data will provide information as to the depth and extent of excavation required to remove elevated levels of TCE. Upon receipt of all of the analytical results, an appropriate closure plan will be designed and submitted to the Ohio E.P.A. for approval. The recommended supplemental soils investigation samples are shown in Figure 5.

- **Soils Investigation Area**

  Additional soils investigation will be performed along the fence at the outside storage area due to the elevated levels of metals and TCE detected in the samples collected here. Ten 3-foot borings located at the fence and five feet west and south of the fence will be sampled in the following intervals: 1 foot, 2 feet, 3 feet. The samples will be analyzed by stratum for total metal concentrations of silver, arsenic, cadmium, chromium, and lead. All of the samples will also be analyzed for TCE concentrations. This supplemental soil investigation will determine the lateral and vertical extent of the elevated levels of metals and organics in the soils adjacent to the fence. Upon receipt and interpretation of the analytical results, an appropriate closure plan will be designed and submitted to Ohio E.P.A. for approval. The recommended supplemental soils investigation sample locations are shown in Figure 5.

- **Wastes**

The excavated soils pile will be disposed as hazardous waste.

The excavated asphalt pile will be disposed appropriately, upon receipt of a waste classification from Ohio E.P.A.

The drums of rinseate will be recycled with Vernitron's routinely generated by-product waste stream.

ATTACHMENTS

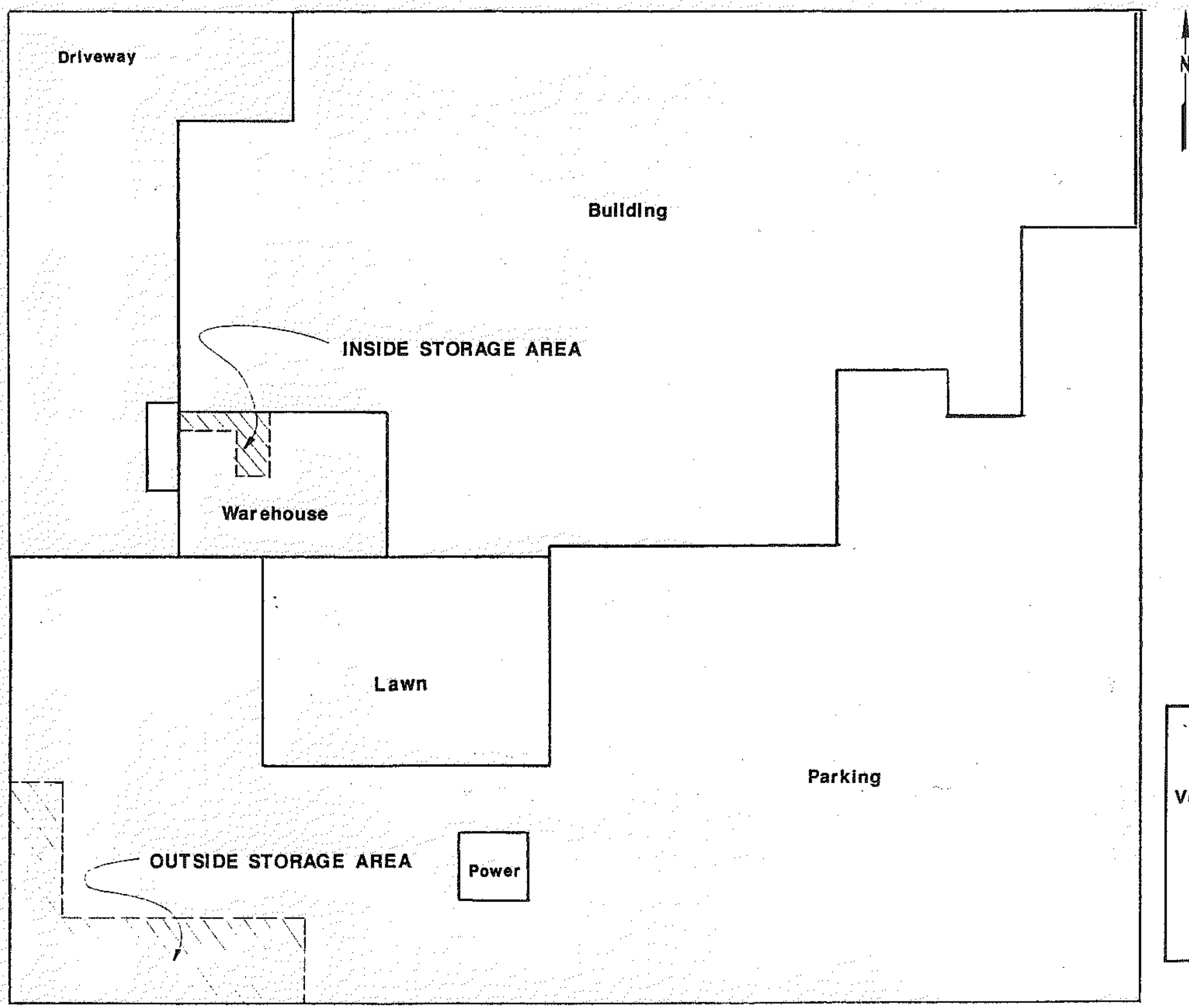


FIGURE 1

Plot Plan
Vernitron Piezoelectric Division
From Partial Closure Plan

Toxcon Engineering Co., Inc.
October 1988

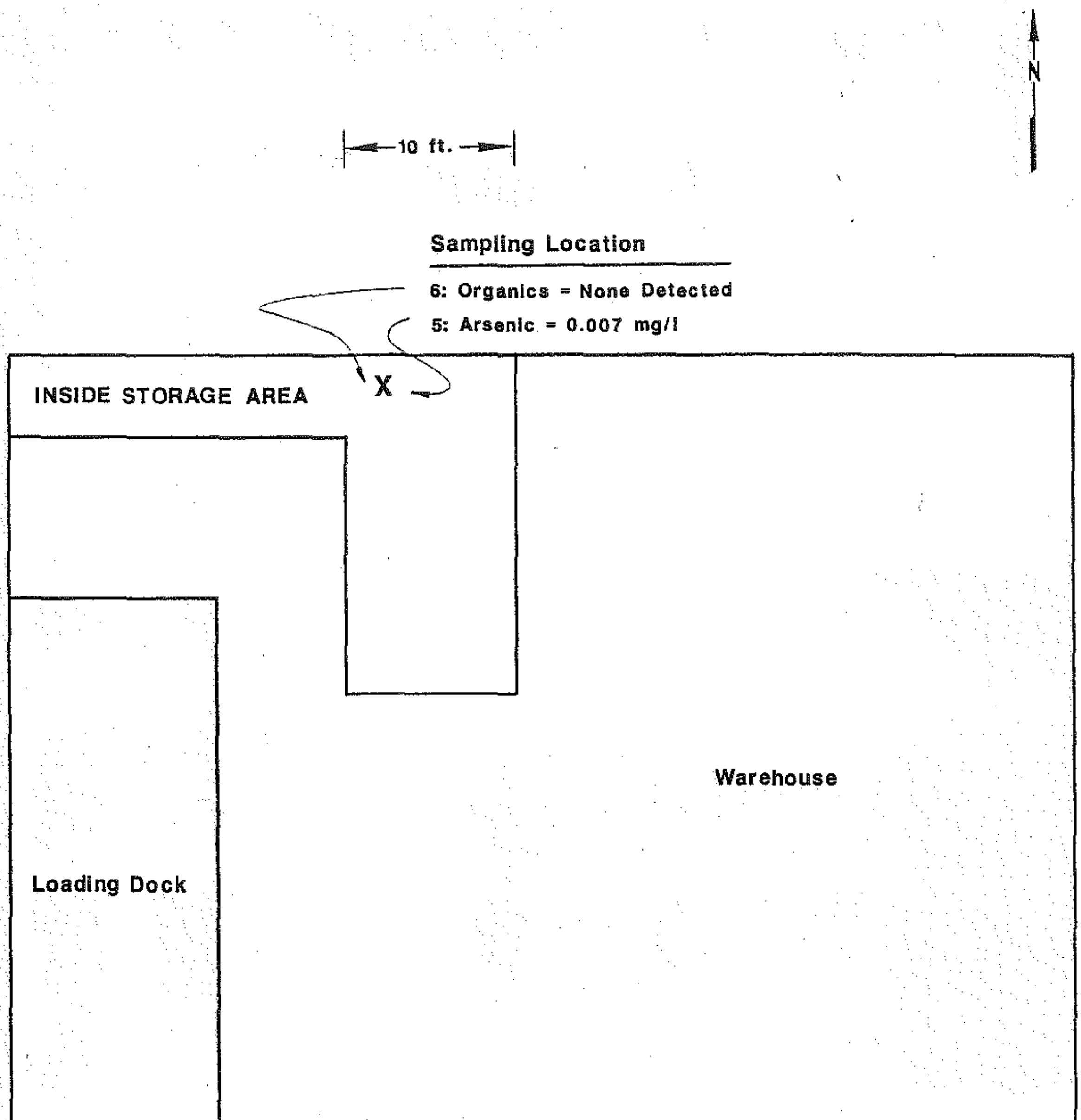


FIGURE 2

Sampling Results: Inside Storage Area
Vernitron Piezoelectric Division

Toxcon Engineering Co., Inc.
October 1988

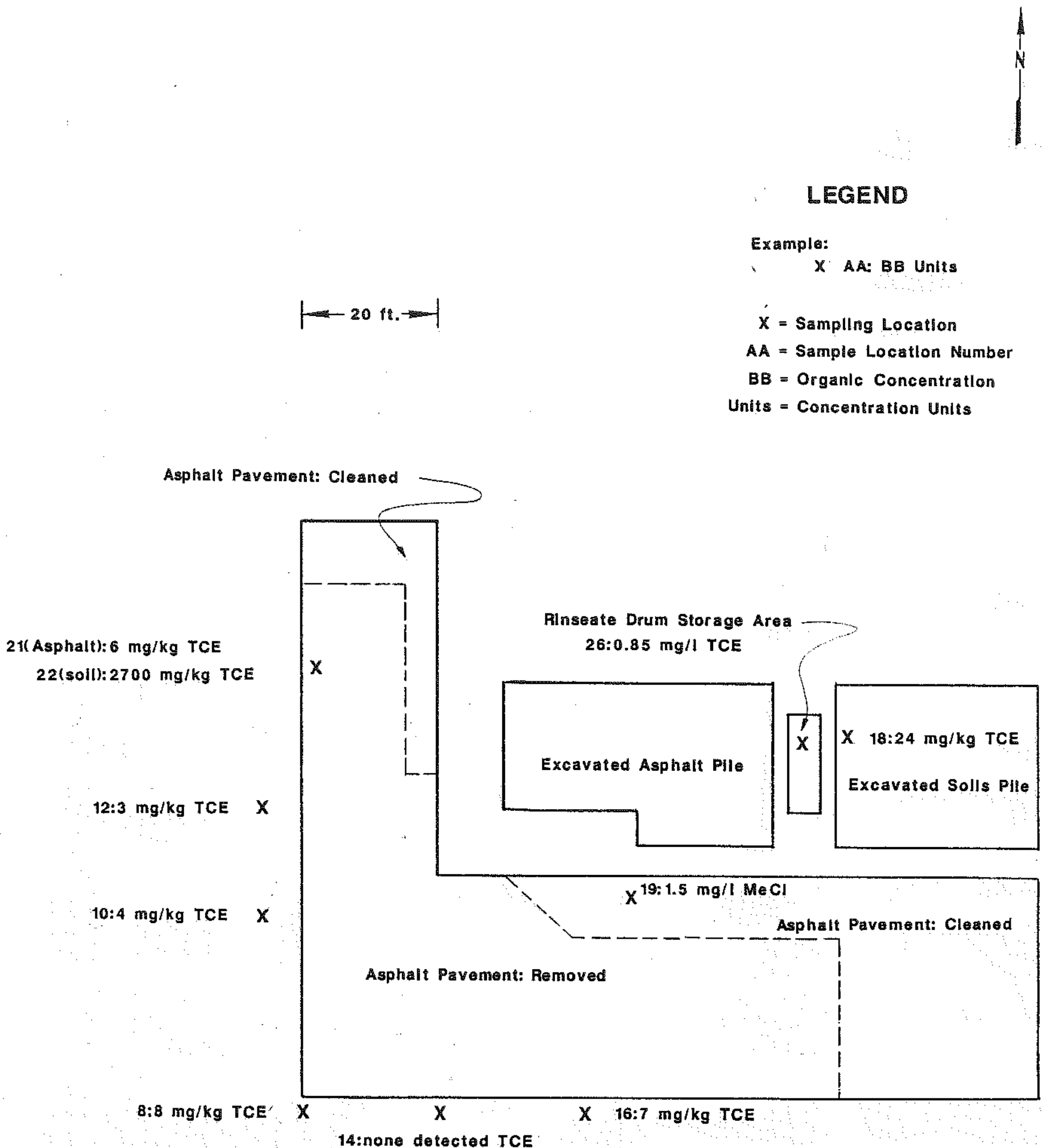


FIGURE 3

Sampling Results: Outside Storage Area
Organic Compounds Only
Vernitron Piezoelectric Division

Toxcon Engineering Co., Inc.
October 1988

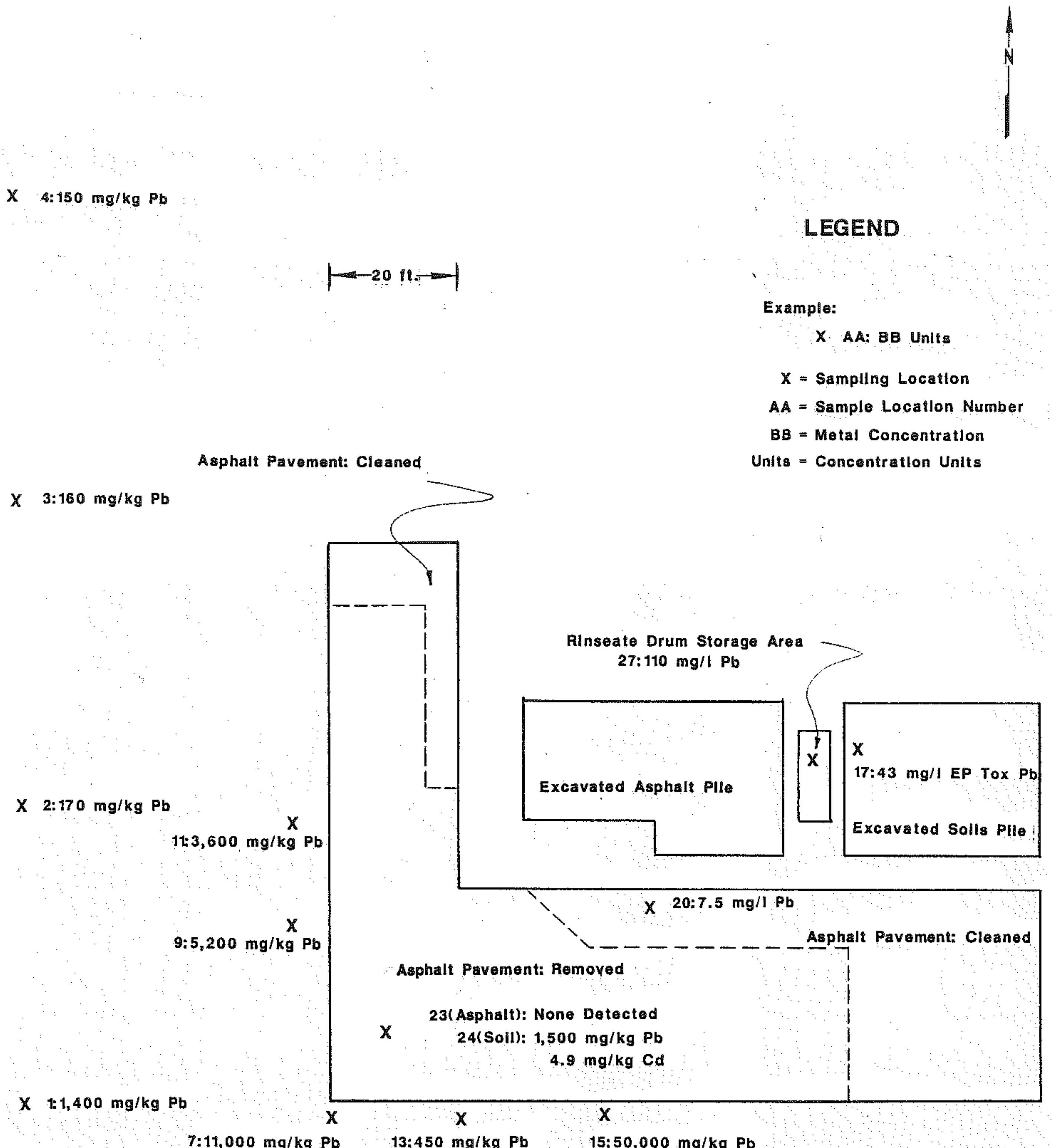


FIGURE 4

Sample Results: Outside Storage Area
Metal Concentrations Only
Vernitron Piezoelectric Division

Toxcon Engineering Co., Inc.
October 1988

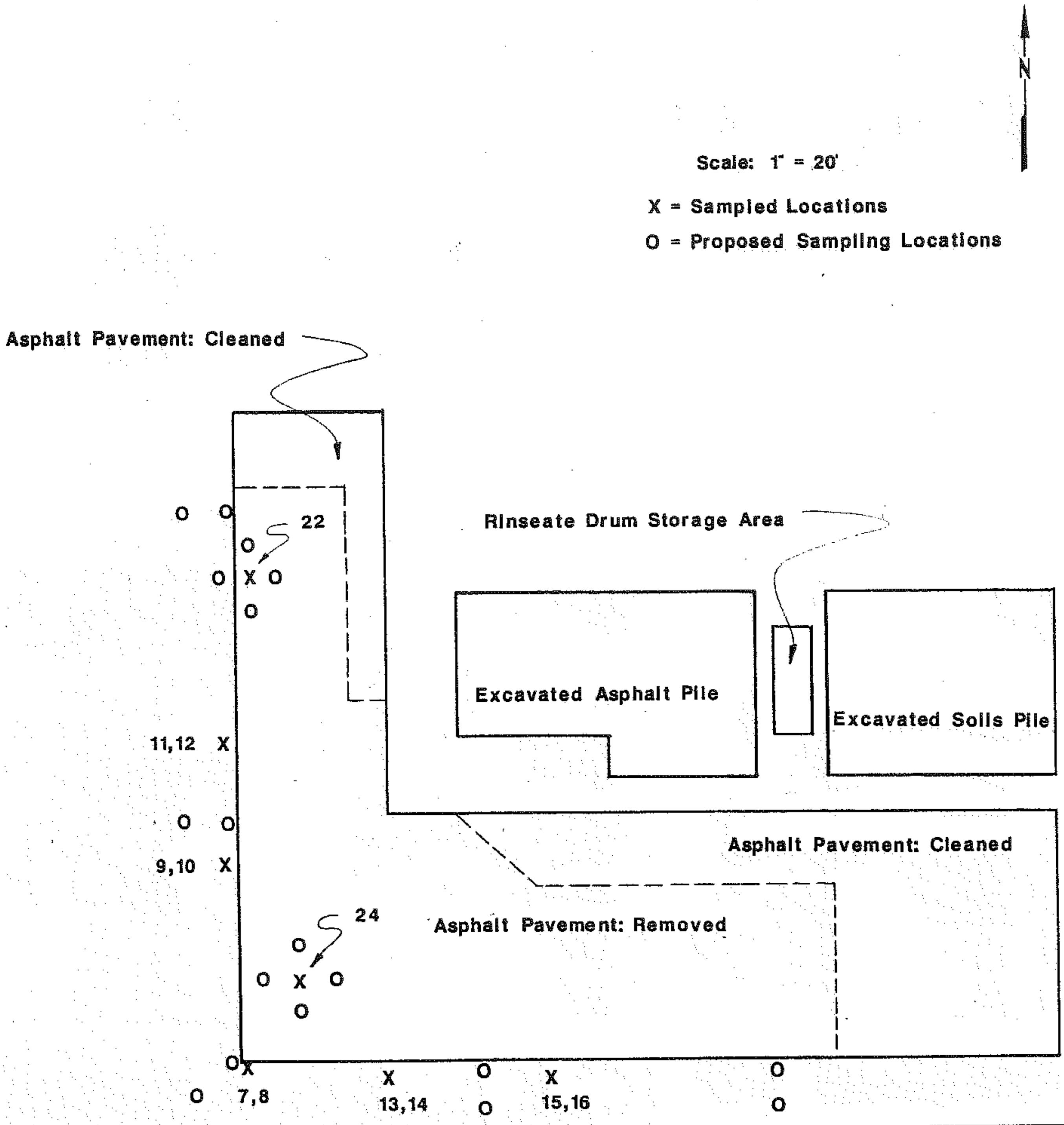


FIGURE 5

PROPOSED SOILS SAMPLING
Vernitron Piezoelectric Division

Toxcon Engineering Co., Inc.
October 1988

Vernitron Piezoelectric Division
Bedford, Ohio

TABLE 1

DESCRIPTION OF SAMPLES

Sample No.'s	Description of Samples
01	Background soil sample, 50' West of SW corner of property
02	Background soil sample, 50' North of Sample 01
03	Background soil sample, 100' North of Sample 01
04	Background soil sample, 150' North of Sample 01
05,06	Inside storage area verification rinse sample
07,08	Investigative soil sample at SW corner of property
09,10	Investigative soil sample, 20' North of Sample 07
11,12	Investigative soil sample, 40' North of Sample 07
13,14	Investigative soil sample, 20' East of Sample 07
15,16	Investigative soil sample, 40' East of Sample 07
17,18	SW-846 sample of excavated soils pile
19,20	Outside storage area verification rinse sample
21	Asphalt sample representative of oil stained area
22	Soil sample under oil stained asphalt
23	Asphalt sample representative of lead stained asphalt
24	Soil sample under lead stained asphalt
25	SW-846 sample of excavated asphalt pile
26.27	SW-846 sample of waste rinseate - Drum #12

Vernitron Piezoelectric Division
Soils Investigation - Total Metals

TABLE 2

Background Data

	BG-1	BG-2	BG-3	BG-4	D	X	S	X+2S
Silver	11	19	ND	ND	2	7.5	9.26	26
Arsenic	7.7	6.3	11	12	5	9.25	.69	14.63
Barium	810	140	51	37	20	259.8	369.8	999.15
Cadmium	1.9	1.6	1.9	2.0	1	1.85	0.17	2.20
Chromium	11	17	12	13	5	13.25	2.63	18.51
Mercury	ND	ND	ND	ND	0.5	0	0	0
Lead	1400	170	160	150	10	470	620.05	1710.11
Selenium	0.6	ND	0.5	0.5	0.5	0.40	0.27	0.94

TABLE 3

Outside Storage Area Concentrations

	SW Corner 7	20'N 9	40'N 11	20'E 13	40'E 15	Soil Below Asphalt @ SW Corner 24	Comparison Values
Silver	37	13	3	ND	310	7	26
Arsenic	21	15	12	13	11	1	14.63
Barium	170	55	180	28	370	270	999.15
Cadmium	2.6	2.2	2.2	1.9	3.8	4.9	2.20
Chromium	19	16	18	15	47	12	18.51
Mercury	0.56	0.74	ND	ND	1.4	ND	0
Lead	11,000	5,200	3,600	450	50,000	1500	1710
Selenium	ND	0.5	0.5	0.5	ND	ND	0.94

All Values in mg/kg (ppm)
ND - None Detected
DL - Detection Limit
ND value given as 0 in statistical calculations
X - Average
S - Standard Deviation

APPENDIX A

Certified Laboratory Results
and
Chain-of-Custody

1938-1988
WADSWORTH/ALERT
LABORATORIES, INC.
50 YEARS
Sampling, testing, mobile labs
5405 E. Schaaf Rd./P.O. Box 31454/Cleveland, OH 44131/(216) 642-9151

ANALYTICAL REPORT

Project No. 5799

Presented to :

Marten Mosis

Toxcon Engineering Company, Inc.

WADSWORTH/ALERT LABORATORIES, INC.

Dale Mori
Project Manager

J. William Botimer
Laboratory Manager - Cleveland

September 26, 1988

CORPORATE AND LABORATORY: North Canton, Ohio (216) 497-9396
LABORATORY: Cleveland, Ohio (216) 642-9151
LABORATORY: Bartow, Florida (813) 533-2150
SOUTHEAST REGIONAL OFFICE: Lexington, South Carolina (803) 957-6590
24-HOUR ALERT LINE: (216) 497-9338

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED:** 8/24/88
LAB #: 5799-31800
MATRIX : SOIL

SAMPLE ID : VPD-82288-11 40' N OF 07

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	8/30- 9/ 9/88	3	2	mg/kg
Arsenic	8/30- 9/ 7/88	12	5	mg/kg
Barium	8/30- 9/ 9/88	180	20	mg/kg
Cadmium	8/30- 9/ 8/88	2.2	1	mg/kg
Chromium	8/30- 9/ 8/88	18	5	mg/kg
Mercury	8/30- 9/ 8/88	ND	0.50	mg/kg
Lead	8/30- 9/ 9/88	3,600	10	mg/kg
Selenium	8/30- 9/ 7/88	0.5	0.5	mg/kg

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Toxcon Engineering Company, Inc.
LAB #: 5799-31801
MATRIX: SOIL

DATE RECEIVED: 8/24/88
DATE EXTRACTED: 8/26/88
DATE ANALYZED: 8/26/88

SAMPLE ID: VPD-82288-12 40' N OF 07

VOLATILE ORGANICS
USEPA METHOD 8240 - GC/MS

Benzene	ND	1,1-Dichloroethene	ND
Bromodichloromethane	ND	trans-1,2-Dichloroethene	ND
Bromoform	ND	1,2-Dichloropropane	ND
Bromomethane	ND*	cis-1,3-Dichloropropene	ND
Carbon tetrachloride	ND	trans-1,3-Dichloropropene	ND
Chlorobenzene	ND	Ethylbenzene	ND
Chloroethane	ND*	Methylene chloride	ND
2-Chloroethylvinyl ether	ND*	1,1,2,2-Tetrachloroethane	ND
Chloroform	ND	Tetrachloroethene	3
Chloromethane	ND*	Toluene	ND
Dibromochloromethane	ND	1,1,1-Trichloroethane	ND
1,2-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,3-Dichlorobenzene	ND	Trichloroethene	0.3 J
1,4-Dichlorobenzene	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND*
1,2-Dichloroethane	ND		

NOTE: ND (None Detected, lower detectable limit = 1 mg/kg) as rec'd
ND* (None Detected, lower detectable limit = 2 mg/kg) as rec'd
J (Detected, but below quantitation limit; quantitation suspect)
B (Compound detected in method blank associated with this sample)
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
1,2-Dichloroethane-d4	114	(76-114)	(70-121)
Toluene-d8	117	(88-110)	(81-117)
Bromofluorobenzene	115	(86-115)	(74-121)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED**: 8/24/88
LAB #: 5799-31802
MATRIX : SOIL

SAMPLE ID : VPD-82288-13 20' E OF 07

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	8/30- 9/ 9/88	ND	2	mg/kg
Arsenic	8/30- 9/ 7/88	13	5	mg/kg
Barium	8/30- 9/ 9/88	28	20	mg/kg
Cadmium	8/30- 9/ 8/88	1.9	1	mg/kg
Chromium	8/30- 9/ 8/88	15	5	mg/kg
Mercury	8/30- 9/ 8/88	ND	0.50	mg/kg
Lead	8/30- 9/ 9/88	450	10	mg/kg
Selenium	8/30- 9/ 7/88	0.5	0.5	mg/kg

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Toxcon Engineering Company, Inc.
LAB #: 5799-31803
MATRIX: SOIL

DATE RECEIVED: 8/24/88
DATE EXTRACTED: 8/26/88
DATE ANALYZED: 8/26/88

SAMPLE ID: VPD-82288-14 20' E OF 07

VOLATILE ORGANICS
USEPA METHOD 8240 - GC/MS

Benzene	ND	1,1-Dichloroethene	ND
Bromodichloromethane	ND	trans-1,2-Dichloroethene	ND
Bromoform	ND	1,2-Dichloropropane	ND
Bromomethane	ND*	cis-1,3-Dichloropropene	ND
Carbon tetrachloride	ND	trans-1,3-Dichloropropene	ND
Chlorobenzene	ND	Ethylbenzene	ND
Chloroethane	ND*	Methylene chloride	ND
2-Chloroethylvinyl ether	ND*	1,1,2,2-Tetrachloroethane	ND
Chloroform	ND	Tetrachloroethene	ND
Chloromethane	ND*	Toluene	ND
Dibromochloromethane	ND	1,1,1-Trichloroethane	ND
1,2-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,3-Dichlorobenzene	ND	Trichloroethene	ND
1,4-Dichlorobenzene	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND*
1,2-Dichloroethane	ND		

NOTE: ND (None Detected, lower detectable limit = 1 mg/kg) as rec'd
ND* (None Detected, lower detectable limit = 2 mg/kg) as rec'd
J (Detected, but below quantitation limit; quantitation suspect)
B (Compound detected in method blank associated with this sample)
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
1,2-Dichloroethane-d4	109	(76-114)	(70-121)
Toluene-d8	105	(88-110)	(81-117)
Bromofluorobenzene	105	(86-115)	(74-121)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED:** 8/24/88
LAB #: 5799-31804
MATRIX : SOIL

SAMPLE ID : VPD-82288-15 40' E OF 07

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	8/30- 9/ 9/88	310	2	mg/kg
Arsenic	8/30- 9/ 7/88	11	5	mg/kg
Barium	8/30- 9/ 9/88	370	20	mg/kg
Cadmium	8/30- 9/ 8/88	3.8	1	mg/kg
Chromium	8/30- 9/ 8/88	47	5	mg/kg
Mercury	8/30- 9/ 8/88	1.4	0.50	mg/kg
Lead	8/30- 9/ 9/88	50,000	200	mg/kg
Selenium	8/30- 9/ 7/88	ND	0.5	mg/kg

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Toxcon Engineering Company, Inc.
LAB #: 5799-31805
MATRIX: SOIL

DATE RECEIVED: 8/24/88
DATE EXTRACTED: 8/26/88
DATE ANALYZED: 8/26/88

SAMPLE ID: VPD-82288-16 40' E OF 07

VOLATILE ORGANICS
USEPA METHOD 8240 - GC/MS

Benzene	ND	1,1-Dichloroethene	ND
Bromodichloromethane	ND	trans-1,2-Dichloroethene	ND
Bromoform	ND	1,2-Dichloropropane	ND
Bromomethane	ND*	cis-1,3-Dichloropropene	ND
Carbon tetrachloride	ND	trans-1,3-Dichloropropene	ND
Chlorobenzene	ND	Ethylbenzene	ND
Chloroethane	ND*	Methylene chloride	ND
2-Chloroethylvinyl ether	ND*	1,1,2,2-Tetrachloroethane	ND
Chloroform	ND	Tetrachloroethene	7
Chloromethane	ND*	Toluene	ND
Dibromochloromethane	ND	1,1,1-Trichloroethane	ND
1,2-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,3-Dichlorobenzene	ND	Trichloroethene	ND
1,4-Dichlorobenzene	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND*
1,2-Dichloroethane	ND		

NOTE: ND (None Detected, lower detectable limit = 1 mg/kg) as rec'd
ND* (None Detected, lower detectable limit = 2 mg/kg) as rec'd
J (Detected, but below quantitation limit; quantitation suspect)
B (Compound detected in method blank associated with this sample)
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
1,2-Dichloroethane-d4	108	(76-114)	(70-121)
Toluene-d8	105	(88-110)	(81-117)
Bromofluorobenzene	103	(86-115)	(74-121)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED:** 8/24/88
LAB #: 5799-31806
MATRIX : SOIL

SAMPLE ID : VPD-82388-17 GRID #7 - EXCAVATED SOILS PILE

METALS ANALYTICAL REPORT
SELECTED LIST

Leachate testing in accordance with USEPA Manual SW846 Method 1310

EP EXTRACTION DATE: 8/25/88

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	8/31- 9/ 1/88	ND	0.02	mg/l
Arsenic	8/31- 9/ 1/88	ND	0.005	mg/l
Barium	8/31- 9/ 1/88	0.69	0.20	mg/l
Cadmium	8/31- 9/ 1/88	0.05	0.01	mg/l
Chromium	8/31- 9/ 1/88	ND	0.05	mg/l
Mercury	8/31- 9/ 1/88	ND	0.005	mg/l
Lead	8/31- 9/ 1/88	43	0.10	mg/l
Selenium	8/31- 9/ 1/88	ND	0.005	mg/l
Initial pH	8/25/88	6.5		su
Final pH	8/26/88	4.9		su

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Toxcon Engineering Company, Inc.
LAB #: 5799-31807
MATRIX: SOIL

DATE RECEIVED: 8/24/88
DATE EXTRACTED: 8/26/88
DATE ANALYZED: 8/26/88

SAMPLE ID: VPD-82388-18 GRID #7 - EXCAVATED SOILS PILE

VOLATILE ORGANICS
USEPA METHOD 8240 - GC/MS

Benzene	ND	1,1-Dichloroethene	ND
Bromodichloromethane	ND	trans-1,2-Dichloroethene	ND
Bromoform	ND	1,2-Dichloropropane	ND
Bromomethane	ND*	cis-1,3-Dichloropropene	ND
Carbon tetrachloride	ND	trans-1,3-Dichloropropene	ND
Chlorobenzene	ND	Ethylbenzene	ND
Chloroethane	ND*	Methylene chloride	ND
2-Chloroethylvinyl ether	ND*	1,1,2,2-Tetrachloroethane	ND
Chloroform	ND	Tetrachloroethene	24
Chloromethane	ND*	Toluene	ND
Dibromochloromethane	ND	1,1,1-Trichloroethane	ND
1,2-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,3-Dichlorobenzene	ND	Trichloroethene	2
1,4-Dichlorobenzene	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND*
1,2-Dichloroethane	ND		

NOTE: ND (None Detected, lower detectable limit = 1 mg/kg) as rec'd
ND* (None Detected, lower detectable limit = 2 mg/kg) as rec'd
J (Detected, but below quantitation limit; quantitation suspect)
B (Compound detected in method blank associated with this sample)
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
1,2-Dichloroethane-d4	106	(76-114)	(70-121)
Toluene-d8	103	(88-110)	(81-117)
Bromofluorobenzene	102	(86-115)	(74-121)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Toxcon Engineering Company, Inc.
LAB #: 5799-31808
MATRIX: WATER

DATE RECEIVED: 8/24/88
DATE EXTRACTED: 9/ 1/88
DATE ANALYZED: 9/ 1/38

SAMPLE ID: VPD-82488-19 GRID #11

VOLATILE ORGANICS
USEPA METHOD 8240 - GC/MS

Benzene	ND	1,1-Dichloroethene	ND
Bromodichloromethane	ND	trans-1,2-Dichloroethene	ND
Bromoform	ND	1,2-Dichloropropane	ND
Bromomethane	ND*	cis-1,3-Dichloropropene	ND
Carbon tetrachloride	ND	trans-1,3-Dichloropropene	ND
Chlorobenzene	ND	Ethylbenzene	ND
Chloroethane	ND*	Methylene chloride	1,500
2-Chloroethylvinyl ether	ND*	1,1,2,2-Tetrachloroethane	ND
Chloroform	ND	Tetrachloroethene	ND
Chloromethane	ND*	Toluene	ND
Dibromochloromethane	ND	1,1,1-Trichloroethane	ND
1,2-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,3-Dichlorobenzene	ND	Trichloroethene	ND
1,4-Dichlorobenzene	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND*
1,2-Dichloroethane	ND		

NOTE: ND (None Detected, lower detectable limit = 8 ug/l) as rec'd
ND* (None Detected, lower detectable limit = 17 ug/l) as rec'd
J (Detected, but below quantitation limit; quantitation suspect)
B (Compound detected in method blank associated with this sample)
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
1,2-Dichloroethane-d4	97	(76-114)	(70-121)
Toluene-d8	102	(88-110)	(81-117)
Bromofluorobenzene	103	(86-115)	(74-121)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Toxcon Engineering Company, Inc.
LAB #: 5799-31808
MATRIX: WATER

DATE RECEIVED: 8/24/88
DATE EXTRACTED: 9/ 1/88
DATE ANALYZED: 9/ 1/88

SAMPLE ID: VPD-82488-19 GRID #11

VOLATILE ORGANICS
OTHER COMPOUNDS

None

MASS SPECTROMETER/DATA SYSTEM (MSDS) TENTATIVELY IDENTIFIED COMPOUNDS
with their estimated concentrations

1-Chlorohexane	<20	ug/l
Chlorotoluene	<20	ug/l
Dibromomethane	<20	ug/l
Total Xylenes	<20	ug/l
Bromobenzene	<20	ug/l

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED:** 8/24/88
LAB #: 5799-31809
MATRIX : WATER

SAMPLE ID : VPD-82488-20 GRID #11

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	8/30- 9/ 9/88	ND	0.02	mg/l
Arsenic	8/30- 9/ 1/88	0.008	0.005	mg/l
Barium	8/30- 9/ 9/88	ND	0.20	mg/l
Cadmium	8/30- 9/ 8/88	0.01	0.01	mg/l
Chromium	8/30- 9/ 8/88	ND	0.05	mg/l
Mercury	8/30- 9/ 1/88	ND	0.005	mg/l
Lead	8/30- 9/ 9/88	7.5	.10	mg/l
Selenium	8/30- 9/ 1/88	ND	0.005	mg/l

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Toxcon Engineering Company, Inc.
LAB #: 5800-31812
MATRIX: SOLID

DATE RECEIVED: 8/24/88
DATE EXTRACTED: 9/ 6/88
DATE ANALYZED: 9/ 7/88

SAMPLE ID: VPD-82488-21

VOLATILE ORGANICS
USEPA METHOD 8240 - GC/MS

Benzene	ND	1,1-Dichloroethene	ND
Bromodichloromethane	ND	trans-1,2-Dichloroethene	3
Bromoform	ND	1,2-Dichloropropane	ND
Bromomethane	ND*	cis-1,3-Dichloropropene	ND
Carbon tetrachloride	ND	trans-1,3-Dichloropropene	ND
Chlorobenzene	ND	Ethylbenzene	ND
Chloroethane	ND*	Methylene chloride	ND
2-Chloroethylvinyl ether	ND*	1,1,2,2-Tetrachloroethane	ND
Chloroform	ND	Tetrachloroethene	6
Chloromethane	ND*	Toluene	ND
Dibromochloromethane	ND	1,1,1-Trichloroethane	ND
1,2-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,3-Dichlorobenzene	ND	Trichloroethene	0.6 J
1,4-Dichlorobenzene	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND*
1,2-Dichloroethane	ND		

NOTE: ND (None Detected, lower detectable limit = 1 mg/kg) as rec'd
ND* (None Detected, lower detectable limit = 2 mg/kg) as rec'd
J (Detected, but below quantitation limit; quantitation suspect)
B (Compound detected in method blank associated with this sample)
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
1,2-Dichloroethane-d4	104	(76-114)	(70-121)
Toluene-d8	108	(88-110)	(81-117)
Bromofluorobenzene	107	(86-115)	(74-121)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Toxcon Engineering Company, Inc.
LAB #: 5800-31813
MATRIX: SOLID

DATE RECEIVED: 8/24/88
DATE EXTRACTED: 9/ 6/88
DATE ANALYZED: 9/ 7/88

SAMPLE ID: VPD-82488-22

VOLATILE ORGANICS
USEPA METHOD 8240 - GC/MS

Benzene	ND	1,1-Dichloroethene	ND
Bromodichloromethane	ND	trans-1,2-Dichloroethene	ND
Bromoform	ND	1,2-Dichloropropane	ND
Bromomethane	ND*	cis-1,3-Dichloropropene	ND
Carbon tetrachloride	ND	trans-1,3-Dichloropropene	ND
Chlorobenzene	ND	Ethylbenzene	ND
Chloroethane	ND*	Methylene chloride	ND
2-Chloroethylvinyl ether	ND*	1,1,2,2-Tetrachloroethane	ND
Chloroform	ND	Tetrachloroethene	2,700
Chloromethane	ND*	Toluene	ND
Dibromochloromethane	ND	1,1,1-Trichloroethane	ND
1,2-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,3-Dichlorobenzene	ND	Trichloroethene	400
1,4-Dichlorobenzene	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND*
1,2-Dichloroethane	ND		

NOTE: ND (None Detected, lower detectable limit = 94 mg/kg) as rec'd
ND* (None Detected, lower detectable limit = 190 mg/kg) as rec'd
J (Detected, but below quantitation limit; quantitation suspect)
B (Compound detected in method blank associated with this sample)
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
1,2-Dichloroethane-d4	DIL	(76-114)	(70-121)
Toluene-d8	DIL	(88-110)	(81-117)
Bromofluorobenzene	DIL	(86-115)	(74-121)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED:** 8/24/88
LAB #: 5800-31814
MATRIX : SOLID

SAMPLE ID : VPD-82488-23

METALS ANALYTICAL REPORT
SELECTED LIST

Leachate testing in accordance with USEPA Manual SW846 Method 1310

EP EXTRACTION DATE: 9/ 6/88

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	9/ 7- 9/17/88	0.03	0.02	mg/l
Arsenic	9/ 7- 9/20/88	ND	0.005	mg/l
Barium	9/ 7- 9/19/88	3.7	0.20	mg/l
Cadmium	9/ 7- 9/17/88	0.04	0.01	mg/l
Chromium	9/ 7- 9/17/88	0.05	0.05	mg/l
Mercury	9/ 7- 9/ 8/88	ND	0.005	mg/l
Lead	9/ 7- 9/17/88	ND	0.10	mg/l
Selenium	9/ 7- 9/20/88	ND	0.005	mg/l
Initial pH	9/ 6/88	6.8		su
Final pH	9/ 7/88	4.9		su

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED:** 8/24/88
LAB #: 5800-31815
MATRIX : SOLID

SAMPLE ID : VPD-82488-24

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	9/12- 9/17/88	7	2	mg/kg
Arsenic	9/12- 9/20/88	1	0.5	mg/kg
Barium	9/12- 9/19/88	270	20	mg/kg
Cadmium	9/12- 9/17/88	4.9	1	mg/kg
Chromium	9/12- 9/17/88	12	5	mg/kg
Mercury	9/12- 9/16/88	ND	0.5	mg/kg
Lead	9/12- 9/17/88	1,500	50	mg/kg
Selenium	9/12- 9/20/88	ND	0.50	mg/kg

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Toxcon Engineering Company, Inc.
LAB #: 5799-31810
MATRIX: WATER

DATE RECEIVED: 8/24/88
DATE EXTRACTED: 9/ 1/88
DATE ANALYZED: 9/ 1/88

SAMPLE ID: VPD-82488-26 WASTE RINSEATE - 12

VOLATILE ORGANICS
METHOD 8010/8020 - GC

Benzene	ND	Dibromochloromethane	ND
Benzyl chloride	ND*	Dibromomethane	ND
Bis(2-chloroethoxy)methane	ND	1,2-Dichlorobenzene	7.4
Bis(2-chloroisopropyl)ether	ND**	1,3-Dichlorobenzene	ND
Bromobenzene	ND	1,4-Dichlorobenzene	ND
Bromodichloromethane	ND	Dichlorodifluoromethane	ND*
Bromoform	ND*	1,1-Dichloroethane	ND
Bromomethane	ND*	1,2-Dichloroethane	ND
Carbon tetrachloride	ND	1,1-Dichloroethylene	ND
Chloroacetaldehyde	--	trans-1,2-Dichloroethylene	ND
Chlorobenzene	ND	Dichloromethane	ND
Chloroethane	ND*	1,2-Dichloropropane	ND
Chloroform	6.7	trans-1,3-Dichloropropylene	ND
1-Chlorohexane	ND*	Ethylbenzene	ND
2-Chloroethyl vinyl ether	ND*	1,1,2,2-Tetrachloroethane	ND
Chloromethane	ND*	1,1,1,2-Tetrachloroethane	--
Chloromethyl methyl ether	--	Tetrachloroethylene	850
Chlorotoluene	ND	Toluene	12

NOTE: ND (None Detected, lower detectable limit = 1 ug/l) as rec'd
ND* (None Detected, lower detectable limit = 5 ug/l) as rec'd
ND** (None Detected, lower detectable limit = 25 ug/l) as rec'd
-- (Not Analyzed)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Toxcon Engineering Company, Inc.
LAB #: 5799-31810
MATRIX: WATER

DATE RECEIVED: 8/24/88
DATE EXTRACTED: 9/ 1/88
DATE ANALYZED: 9/ 1/88

SAMPLE ID: VPD-82488-26 WASTE RINSEATE - 12

VOLATILE ORGANICS
METHOD 8010/8020 - GC

1,1,1-Trichloroethane	ND
1,1,2-Trichloroethane	--
Trichloroethylene	24
Trichlorofluoromethane	ND
Trichloropropane	ND*
Vinyl chloride	ND
Xylenes	ND

NOTE: ND (None Detected, lower detectable limit = 1 ug/l) as rec'd
ND* (None Detected, lower detectable limit = 5 ug/l) as rec'd
ND** (None Detected, lower detectable limit = 25 ug/l) as rec'd
— (Not Analyzed)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED:** 8/24/88
LAB #: 5799-31811
MATRIX : WATER

SAMPLE ID : VPD-82488-27 WASTE RINSEATE - 12

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	8/30- 9/ 9/88	0.09	0.02	mg/l
Arsenic	8/30- 9/ 1/88	0.008	0.005	mg/l
Barium	8/30- 9/ 9/88	1.6	0.20	mg/l
Cadmium	8/30- 9/ 8/88	0.02	0.01	mg/l
Chromium	8/30- 9/ 8/88	0.09	0.05	mg/l
Mercury	8/30- 9/ 1/88	ND	0.005	mg/l
Lead	8/30- 9/ 9/88	110	1	mg/l
Selenium	8/30- 9/ 1/88	ND	0.005	mg/l

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

QUALITY CONTROL SECTION

WADSWORTH/ALERT
LABORATORIES, INC.

MATRIX SPIKE DATA

LAB ID	PARAMETER	SPIKE PERCENT RECOVERY	SPK/DUP PERCENT RECOVERY	SPIKE MATRIX
880706	Silver	78	73	SOLID
880720	Arsenic	102	100	
880722	Barium	115	75	
880722	Cadmium	110	110	
880722	Chromium	64	61	
880722	Mercury	84	72	
880722	Lead	104	102	
880722	Selenium	85	70	

WADSWORTH/ALERT
LABORATORIES, INC.

MATRIX SPIKE DATA

LAB ID	PARAMETER	SPIKE PERCENT RECOVERY	SPK/DUP PERCENT RECOVERY	SPIKE MATRIX
880819	Silver	104	105	WATER
880729	Arsenic	105	100	
880729	Barium	62	95	
880729	Cadmium	110	110	
880729	Chromium	97	97	
880729	Mercury	100	100	
880729	Lead	94	96	
880729	Selenium	110	115	

WADSWORTH/ALERT
LABORATORIES, INC.

MATRIX SPIKE DATA

LAB ID	PARAMETER	SPIKE PERCENT RECOVERY	SPK/DUP PERCENT RECOVERY	SPIKE MATRIX
880701	1,1-Dichloroethene	74	78	LIQUID
	Trichloroethene	77	77	
	Chlorobenzene	84	88	
	Toluene	107	104	
	Benzene	103	103	

WADSWORTH/ALERT LABORATORIES, INC.

MATRIX SPIKE DATA

LAB ID	PARAMETER	SPIKE PERCENT RECOVERY	SPK/DUP PERCENT RECOVERY	SPIKE MATRIX
	GC/MS VOLATILE COMPOUNDS			
880825	1,1-Dichloroethene	94	90	SOLID
	Trichloroethene	90	87	
	Chlorobenzene	96	96	
	Toluene	92	90	
	Benzene	99	96	

WADSWORTH/ALERT
LABORATORIES, INC.

METALS
MATRIX SPIKE RECOVERY
CONTROL LIMITS

PARAMETER	WATER RECOVERY CONTROL LIMITS	SOLID RECOVERY CONTROL LIMITS
Aluminum	75-125	75-125
Antimony	57-102	46-113
Arsenic	21-121	32-142
Barium	54-136	52-123
Beryllium	85-132	74-143
Cadmium	90-113	51-126
Calcium	77-124	65-136
Chromium	59-139	61-143
Cobalt	75-125	75-125
Copper	89-106	82-108
Hexavalent Chrome	80-122	70-133
Iron	76-105	69-112
Lead	61-124	59-127
Lithium	83-143	68-158
Magnesium	76-120	65-131
Manganese	81-112	73-120
Mercury	76-131	58-139
Nickel	86-114	75-114
Potassium	77-113	68-122
Selenium	50-119	21-114
Silicon	75-125	75-125
Silver	73-116	53-123
Silver (EP Tox)	26-103	*
Sodium	86-112	80-119
Thallium	62-129	45-146
Zinc	68-162	77-130

* - Not Applicable

7/19/88

WADSWORTH/ALERT LABORATORIES, INC.

BTX
METHOD 601/602
METHOD 8010/8020
MATRIX SPIKE RECOVERY CONTROL LIMITS

PARAMETER	WATER RECOVERY CONTROL LIMITS	SOLID RECOVERY CONTROL LIMITS
Benzene	77-126	68-133
Chlorobenzene	69-130	50-131
1,1-Dichloroethene	46-131	43-118
Toluene	69-126	74-123
Trichloroethene	70-126	66-125
Xylene	51-127	63-110

7/19/88

WADSWORTH/ALERT
LABORATORIES, INC.

GC/MS MATRIX SPIKE RECOVERY
CONTROL LIMITS

PARAMETER	WATER RECOVERY CONTROL LIMITS	SOLID RECOVERY CONTROL LIMITS
1,1-Dichloroethene	61-145	59-172
Trichloroethene	71-120	62-137
Chlorobenzene	75-130	60-133
Toluene	76-125	59-139
Benzene	76-127	66-142
1,2,4-Trichlorobenzene	39- 98	38-107
Acenaphthene	46-118	31-137
2,4-Dinitrotoluene	24- 96	28- 89
Pyrene	26-127	35-142
N-Nitroso-Di-n-Propylamine	41-116	41-126
1,4-Dichlorobenzene	36- 97	28-104
Pentachlorophenol	9-103	17-109
Phenol	12- 89	26- 90
2-Chlorophenol	27-123	25-102
4-Chloro-3-Methylphenol	23- 97	26-103
4-Nitrophenol	10- 80	11-114

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Wadsworth/Alert Laboratories, Inc. **RECEIVING DATE :** 8/30/88
LABORATORY ID : 9288-92830
SAMPLE MATRIX : SOLID

SAMPLE ID : INTRA-LAB BLANK , 8 /30/88

METALS ANALYTICAL BLANK REPORT

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT
Silver	8/30- 9/ 9/88	ND	2 mg/kg
Arsenic	8/30- 9/ 7/88	ND	0.50 mg/kg
Barium	8/30- 9/ 9/88	ND	20 mg/kg
Cadmium	8/30- 9/ 8/88	ND	1 mg/kg
Chromium	8/30- 9/ 8/88	ND	5 mg/kg
Mercury	8/30- 9/ 8/88	ND	0.50 mg/kg
Lead	8/30- 9/ 9/88	ND	10 mg/kg
Selenium	8/30- 9/ 7/88	ND	0.50 mg/kg

ND - NONE DETECTED

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Wadsworth/Alert Laboratories, Inc. **RECEIVING DATE :** 8/30/88
LABORATORY ID : 9088-90830
SAMPLE MATRIX : WATER

SAMPLE ID : INTRA-LAB BLANK , 8 /30/88

METALS ANALYTICAL BLANK REPORT

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT
Silver	8/30- 9/ 9/88	ND	0.02 mg/l
Arsenic	8/30- 9/ 1/88	ND	0.005 mg/l
Barium	8/30- 9/ 9/88	ND	0.20 mg/l
Cadmium	8/30- 9/ 8/88	ND	0.01 mg/l
Chromium	8/30- 9/ 8/88	ND	0.05 mg/l
Mercury	8/30- 9/ 1/88	ND	0.005 mg/l
Lead	8/30- 9/ 9/88	ND	0.05 mg/l
Selenium	8/30- 9/ 1/88	ND	0.005 mg/l

ND - NONE DETECTED

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Wadsworth/Alert Laboratories, Inc. **RECEIVING DATE** : 8/31/88
LABORATORY ID : 9088-90831
SAMPLE MATRIX : WATER

SAMPLE ID : INTRA-LAB BLANK , 8 /31/88

METALS ANALYTICAL BLANK REPORT

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT
Silver	8/31- 9/ 1/88	ND	0.02 mg/l
Arsenic	8/31/88	ND	0.005 mg/l
Barium	8/31- 9/ 1/88	ND	0.20 mg/l
Cadmium	8/31- 9/ 1/88	ND	0.01 mg/l
Chromium	8/31/88	ND	0.05 mg/l
Mercury	8/31- 9/ 1/88	ND	0.005 mg/l
Lead	8/31/88	ND	0.10 mg/l
Selenium	8/31/88	ND	0.005 mg/l

ND - NONE DETECTED

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Wadsworth/Alert Laboratories
LAB #: 9088-90901
MATRIX: WATER

DATE RECEIVED: 9/ 1/88
DATE EXTRACTED: 9/ 1/88
DATE ANALYZED: 9/ 1/88

SAMPLE ID: INTRA-LAB BLANK , 9 /1 /88

SELECTED ORGANIC COMPOUNDS ANALYTICAL BLANK REPORT

PARAMETER	RESULT (ug/l)	DETECTION LIMIT
Benzene	ND	1
Bromodichloromethane	ND	1
Bromoform	ND	5
Bromomethane	ND	2
Carbon tetrachloride	ND	1
Chlorobenzene	ND	1
Chloroethane	ND	2
Chloroform	ND	1
2-Chloroethyl vinyl ether	ND	5
Chloromethane	ND	2
Dibromochloromethane	ND	1
1,2-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
Dichlorodifluoromethane	ND	2
1,1-Dichloroethane	ND	1
1,2-Dichloroethane	ND	1
1,1-Dichloroethylene	ND	1
trans-1,2-Dichloroethylene	ND	1
Dichloromethane	ND	1
1,2-Dichloropropane	ND	1
1,3-Dichloropropylene	ND	1
Ethylbenzene	ND	1
1,1,2,2-Tetrachloroethane	ND	1
Tetrachloroethene	ND	1

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Wadsworth/Alert Laboratories
LAB #: 9088-90901
MATRIX: WATER

DATE RECEIVED: 9/ 1/88
DATE EXTRACTED: 9/ 1/88
DATE ANALYZED: 9/ 1/88

SAMPLE ID: INTRA-LAB BLANK , 9 /1 /88

SELECTED ORGANIC COMPOUNDS ANALYTICAL BLANK REPORT - 2

PARAMETER	RESULT (ug/l)	DETECTION LIMIT
Toluene	ND	1
1,1,1-Trichloroethane	ND	1
1,1,2-Trichloroethane	ND	1
Trichloroethene	ND	1
Trichlorofluoromethane	ND	1
Vinyl chloride	ND	1
Xylenes	ND	1

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Wadsworth/Alert Laboratories
LAB #: 9288-92826
MATRIX: SOLID

DATE RECEIVED: 8/26/88
DATE EXTRACTED: 8/26/88
DATE ANALYZED: 8/26/88

SAMPLE ID: INTRA-LAB BLANK , 8 /26/88

VOLATILE ORGANICS
BLANK COMPOUND LIST - GC/MS

Acetone	ND**	1,1-Dichloroethane	ND
Acrolein	ND*	1,2-Dichloroethane	ND
Acrylonitrile	ND*	1,1-Dichloroethene	ND
2-Butanone	ND**	1,2-Dichloroethene (total)	ND
Benzene	ND	1,2-Dichloropropane	ND
Bromodichloromethane	ND	cis-1,3-Dichloropropene	ND
Bromoform	ND	trans-1,3-Dichloropropene	ND
Bromomethane	ND*	Ethylbenzene	ND
Carbon disulfide	ND	2-Hexanone	ND**
Carbon tetrachloride	ND	4-Methyl-2-pentanone	ND**
Chlorobenzene	ND	Methylene chloride	ND
Chloroethane	ND*	Styrene	ND
Chloroform	ND	1,1,2,2-Tetrachloroethane	ND
2-Chloroethyl vinyl ether	ND*	Tetrachloroethene	ND
Chloromethane	ND*	Toluene	ND
Chloromethyl methyl ether	ND	1,1,1-Trichloroethane	ND
Dibromochloromethane	ND	1,1,2-Trichloroethane	ND
1,2-Dichlorobenzene	ND	Trichloroethene	ND
1,3-Dichlorobenzene	ND	Trichlorofluoromethane	ND
1,4-Dichlorobenzene	ND	Vinyl acetate	ND**
Dichlorodifluoromethane	ND*	Vinyl chloride	ND*
		Total xylenes	ND

NOTE: ND (None Detected, lower detectable limit = 1 mg/kg) as rec'd
ND* (None Detected, lower detectable limit = 2 mg/kg) as rec'd
ND** (None Detected, lower detectable limit = 5 mg/kg) as rec'd
J (Detected , but below quantitation limit; quantitation suspect)
-- (Not Analyzed)

SURROGATE RECOVERY:	%	ACCEPTABLE LIMITS WATER	SOLID
1,2-Dichloroethane-d4	97	(76-114)	(70-121)
Toluene-d8	104	(88-110)	(81-117)
Bromofluorobenzene	103	(86-115)	(74-121)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Wadsworth/Alert Laboratories
LAB #: 9088-90830
MATRIX: WATER

DATE RECEIVED: 8/30/88
DATE EXTRACTED: 8/30/88
DATE ANALYZED: 8/30/88

SAMPLE ID: INTRA-LAB BLANK , 8 /30/88

VOLATILE ORGANICS
BLANK COMPOUND LIST - GC/MS

Acetone	ND**	1,1-Dichloroethane	ND
Acrolein	ND*	1,2-Dichloroethane	ND
Acrylonitrile	ND*	1,1-Dichloroethene	ND
2-Butanone	ND**	1,2-Dichloroethene (total)	ND
Benzene	ND	1,2-Dichloropropane	ND
Bromodichloromethane	ND	cis-1,3-Dichloropropene	ND
Bromoform	ND	trans-1,3-Dichloropropene	ND
Bromomethane	ND*	Ethylbenzene	ND
Carbon disulfide	ND	2-Hexanone	ND**
Carbon tetrachloride	ND	4-Methyl-2-pentanone	ND**
Chlorobenzene	ND	Methylene chloride	ND
Chloroethane	ND*	Styrene	ND
Chloroform	ND	1,1,2,2-Tetrachloroethane	ND
2-Chloroethyl vinyl ether	ND*	Tetrachloroethene	ND
Chloromethane	ND*	Toluene	ND
Chloromethyl methyl ether	ND	1,1,1-Trichloroethane	ND
Dibromochloromethane	ND	1,1,2-Trichloroethane	ND
1,2-Dichlorobenzene	ND	Trichloroethene	ND
1,3-Dichlorobenzene	ND	Trichlorofluoromethane	ND
1,4-Dichlorobenzene	ND	Vinyl acetate	ND**
Dichlorodifluoromethane	ND*	Vinyl chloride	ND*
		Total xylenes	ND

NOTE: ND (None Detected, lower detectable limit = 5 ug/l) as rec'd
ND* (None Detected, lower detectable limit = 10 ug/l) as rec'd
ND** (None Detected, lower detectable limit = 50 ug/l) as rec'd
J (Detected , but below quantitation limit; quantitation suspect)
-- (Not Analyzed)

SURROGATE RECOVERY:	%	ACCEPTABLE LIMITS WATER	SOLID
1,2-Dichloroethane-d4	97	(76-114)	(70-121)
Toluene-d8	104	(88-110)	(81-117)
Bromofluorobenzene	102	(86-115)	(74-121)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY:	Wadsworth/Alert Laboratories	DATE RECEIVED:	9/ 1/88
LAB #:	9088-90901	DATE EXTRACTED:	9/ 1/88
MATRIX:	WATER	DATE ANALYZED:	9/ 1/88

SAMPLE ID: INTRA-LAB BLANK , 9 /1 /88

VOLATILE ORGANICS
BLANK COMPOUND LIST - GC/MS

Acetone	10 J	1,1-Dichloroethane	ND
Acrolein	ND*	1,2-Dichloroethane	ND
Acrylonitrile	ND*	1,1-Dichloroethene	ND
2-Butanone	ND**	1,2-Dichloroethene (total)	ND
Benzene	ND	1,2-Dichloropropane	ND
Bromodichloromethane	ND	cis-1,3-Dichloropropene	ND
Bromoform	ND	trans-1,3-Dichloropropene	ND
Bromomethane	ND*	Ethylbenzene	ND
Carbon disulfide	ND	2-Hexanone	ND**
Carbon tetrachloride	ND	4-Methyl-2-pentanone	ND**
Chlorobenzene	ND	Methylene chloride	ND
Chloroethane	ND*	Styrene	ND
Chloroform	ND	1,1,2,2-Tetrachloroethane	ND
2-Chloroethyl vinyl ether	ND*	Tetrachloroethene	ND
Chloromethane	ND*	Toluene	N
Chloromethyl methyl ether	ND	1,1,1-Trichloroethane	DN
Dibromochloromethane	ND	1,1,2-Trichloroethane	DN
1,2-Dichlorobenzene	ND	Trichloroethene	ND
1,3-Dichlorobenzene	ND	Trichlorofluoromethane	ND
1,4-Dichlorobenzene	ND	Vinyl acetate	ND**
Dichlorodifluoromethane	ND*	Vinyl chloride	ND*
		Total xylenes	ND

NOTE:
ND (None Detected, lower detectable limit = 5 ug/l) as rec'd
ND* (None Detected, lower detectable limit = 10 ug/l) as rec'd
ND** (None Detected, lower detectable limit = 50 ug/l) as rec'd
J (Detected , but below quantitation limit; quantitation suspect)
-- (Not Analyzed)

SURROGATE RECOVERY:	%	ACCEPTABLE LIMITS WATER	SOLID
1,2-Dichloroethane-d4	101	(76-114)	(70-121)
Toluene-d8	103	(88-110)	(81-117)
Bromofluorobenzene	104	(86-115)	(74-121)

WADSWORTH/ALERT LABORATORIES, INC.

QUALITY CONTROL SECTION

WADSWORTH/ALERT
LABORATORIES, INC.

MATRIX SPIKE DATA

LAB ID	PARAMETER	SPIKE PERCENT RECOVERY	SPK/DUP PERCENT RECOVERY	SPIKE MATRIX
	GC/MS VOLATILE COMPOUNDS			
880906	1,1-Dichloroethene	106	109	SOLID
	Trichloroethene	104	87	
	Chlorobenzene	103	104	
	Toluene	104	102	
	Benzene	113	108	

WADSWORTH/ALERT LABORATORIES, INC.

MATRIX SPIKE DATA

LAB ID	PARAMETER	SPIKE PERCENT RECOVERY	SPK/DUP PERCENT RECOVERY	SPIKE MATRIX
880831	Silver	61	57	EXTRACT
	Arsenic	30	30	
	Barium	113	83	
	Cadmium	105	103	
	Chromium	79	81	
	Mercury	100	104	
	Lead	116	88	
	Selenium	75	50	

WADSWORTH/ALERT
LABORATORIES, INC.

GC/MS MATRIX SPIKE RECOVERY
CONTROL LIMITS

PARAMETER	WATER RECOVERY CONTROL LIMITS	SOLID RECOVERY CONTROL LIMITS
1,1-Dichloroethene	61-145	59-172
Trichloroethene	71-120	62-137
Chlorobenzene	75-130	60-133
Toluene	76-125	59-139
Benzene	76-127	66-142
1,2,4-Trichlorobenzene	39- 98	38-107
Acenaphthene	46-118	31-137
2,4-Dinitrotoluene	24- 96	28- 89
Pyrene	26-127	35-142
N-Nitroso-Di-n-Propylamine	41-116	41-126
1,4-Dichlorobenzene	36- 97	28-104
Pentachlorophenol	9-103	17-109
Phenol	12- 89	26- 90
2-Chlorophenol	27-123	25-102
4-Chloro-3-Methylphenol	23- 97	26-103
4-Nitrophenol	10- 80	11-114

WADSWORTH/ALERT LABORATORIES, INC.

METALS
MATRIX SPIKE RECOVERY
CONTROL LIMITS

PARAMETER	WATER RECOVERY CONTROL LIMITS	SOLID RECOVERY CONTROL LIMITS
Aluminum	75-125	75-125
Antimony	57-102	46-113
Arsenic	21-121	32-142
Barium	54-136	52-123
Beryllium	85-132	74-143
Cadmium	90-113	51-126
Calcium	77-124	65-136
Chromium	59-139	61-143
Cobalt	75-125	75-125
Copper	89-106	82-108
Hexavalent Chrome	80-122	70-133
Iron	76-105	69-112
Lead	61-124	59-127
Lithium	83-143	68-158
Magnesium	76-120	65-131
Manganese	81-112	73-120
Mercury	76-131	58-139
Nickel	86-114	75-114
Potassium	77-113	68-122
Selenium	50-119	21-114
Silicon	75-125	75-125
Silver	73-116	53-123
Silver (EP Tox)	26-103	*
Sodium	86-112	80-119
Thallium	62-129	45-146
Zinc	68-162	77-130

* - Not Applicable

7/19/88

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Wadsworth/Alert Laboratories
LAB #: 9288-92906
MATRIX: SOLID

DATE RECEIVED: 9/ 6/88
DATE EXTRACTED: 9/ 6/88
DATE ANALYZED: 9/ 6/88

SAMPLE ID: INTRA-LAB BLANK , 9 /6 /88

VOLATILE ORGANICS
BLANK COMPOUND LIST - GC/MS

Acetone	ND**	1,1-Dichloroethane	ND
Acrolein	ND*	1,2-Dichloroethane	ND
Acrylonitrile	ND*	1,1-Dichloroethene	ND
2-Butanone	ND**	1,2-Dichloroethene (total)	ND
Benzene	ND	1,2-Dichloropropane	ND
Bromodichloromethane	ND	cis-1,3-Dichloropropene	ND
Bromoform	ND	trans-1,3-Dichloropropene	ND
Bromomethane	ND*	Ethylbenzene	ND
Carbon disulfide	ND	2-Hexanone	ND**
Carbon tetrachloride	ND	4-Methyl-2-pentanone	ND**
Chlorobenzene	ND	Methylene chloride	ND
Chloroethane	ND*	Styrene	ND
Chloroform	ND	1,1,2,2-Tetrachloroethane	ND
2-Chloroethyl vinyl ether	ND*	Tetrachloroethene	ND
Chloromethane	ND*	Toluene	ND
Chloromethyl methyl ether	ND	1,1,1-Trichloroethane	ND
Dibromochloromethane	ND	1,1,2-Trichloroethane	ND
1,2-Dichlorobenzene	ND	Trichloroethene	ND
1,3-Dichlorobenzene	ND	Trichlorofluoromethane	ND
1,4-Dichlorobenzene	ND	Vinyl acetate	ND**
Dichlorodifluoromethane	ND*	Vinyl chloride	ND*
		Total xylenes	ND

NOTE: ND (None Detected, lower detectable limit = 1 mg/kg) as rec'd
ND* (None Detected, lower detectable limit = 2 mg/kg) as rec'd
ND** (None Detected, lower detectable limit = 10 mg/kg) as rec'd
J (Detected , but below quantitation limit; quantitation suspect)
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
1,2-Dichloroethane-d4	96	(76-114)	(70-121)
Toluene-d8	108	(88-110)	(81-117)
Bromofluorobenzene	102	(86-115)	(74-121)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Wadsworth/Alert Laboratories, Inc. **RECEIVING DATE** : 9/ 7/88
LABORATORY ID : 9088-90907
SAMPLE MATRIX : WATER

SAMPLE ID : INTRA-LAB BLANK , 9 /7 /88

METALS ANALYTICAL BLANK REPORT

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT
Silver	9/ 7- 9/17/88	ND	0.02 mg/l
Arsenic	9/ 7- 9/20/88	ND	0.005 mg/l
Barium	9/ 7- 9/19/88	ND	0.20 mg/l
Cadmium	9/ 7- 9/17/88	ND	0.01 mg/l
Chromium	9/ 7- 9/17/88	ND	0.05 mg/l
Mercury	9/ 7- 9/ 8/88	ND	0.005 mg/l
Lead	9/ 7- 9/16/88	ND	0.10 mg/l
Selenium	9/ 7- 9/20/88	ND	0.005 mg/l

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Wadsworth/Alert Laboratories, Inc. **RECEIVING DATE :** 9/12/88
LABORATORY ID : 9288-92912
SAMPLE MATRIX : SOLID

SAMPLE ID : INTRA-LAB BLANK , 9 /12/88

METALS ANALYTICAL BLANK REPORT

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT
Silver	9/12- 9/17/88	ND	2 mg/kg
Arsenic	9/12- 9/20/88	ND	0.5 mg/kg
Barium	9/12- 9/19/88	ND	20 mg/kg
Cadmium	9/12- 9/17/88	ND	1 mg/kg
Chromium	9/12- 9/17/88	ND	5 mg/kg
Mercury	9/12- 9/16/88	ND	0.5 mg/kg
Lead	9/12- 9/16/88	ND	0.5 mg/kg
Selenium	9/12- 9/20/88	ND	0.5 mg/kg

ND - NONE DETECTED

WADSWORTH/ALERT LABORATORIES

4101 SHUFFEL DRIVE N.W./NORTH CANTON, OHIO 44720
(216) 497-9396

Chain-of Custody Record

10695A
№ ~~10695~~

PROJ. NO.	PROJECT NAME/LOCATION
88-431	UPD-HAZWCU- Bedford, OHIO

SAMPLERS: *(Signature)* Robert Finkelstein

STA. NO.	DATE	TIME	COMP.	GRAB.	STATION LOCATION	NO. OF CONTAINERS	Total Metals*	8010	8020	8240		REMARKS
VPD-82288-01	8/22/88	1004		✓	BG-1	1	X					4°C Soil
" -02	"	1010		✓	BG-2	1	X					4°C Soil
" -03	"	1018		✓	BG-3	1	X					4°C Soil
" -04	"	1024		✓	BG-4	1	X					4°C Soil
" -05	"	5:20p		✓	Grid 17-Inside Storage Area	1	X					Added HNO_3, 4°C water
" -06	"	5:20		✓	Grid 17-Inside Storage Area	2		X	X			4°C water
" -07	"	6:10		✓	SW Corner of Lot	1	X					4°C Soil
" -08	"	6:10		✓	SW Corner of Lot	2				X		4°C Soil

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Finkelstein	8/22/88 3:39	Martin Moore			
Martin Moore	8/24/88 5:15	K. Bryak			
		Received for Laboratory by: *(Signature)*			

Remarks
* Total Metals = As, Ba, Cd, Cr, Hg, Se, Ag, Pb

Distribution Original Accompanies Shipment. Copy returned with Report.

WADSWORTH/ALERT LABORATORIES

4101 SHUFFEL DRIVE N.W./NORTH CANTON, OHIO 44720

(216) 497-9396

Chain-of Custody Record

10695 B

№

PROJ. NO.	PROJECT NAME/LOCATION
88-431	VPD-HAZWCU-Bedford, Ohio

SAMPLERS: (Signature) Robert Finkelstein

STA. NO.	DATE	TIME	COMP.	GRAB.	STATION LOCATION	NO. OF CONTAINERS	Total Metals*	8010	8020	8240		REMARKS
VPD-82288-09	8/22/88	6 20 p		✓	20' N of 07	1	X					Soil
" -10	"	6 20 p		✓	20' N of 07	2			X			Soil
" -11	"	6 35 p		✓	40' N of 07	1	X					Soil
" -12	"	6 35 p		✓	40' N of 07	2			X			Soil
" -13	"	6 45 p		✓	20' E of 07	1	X					Soil
" -14	"	6 45 p		✓	20' E of 07	2			X			Soil
" -15	"	6 55 p		✓	40' E of 07	1	X					Soil
" -16	"	6 55 p		✓	40' E of 07	2			X			Soil

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
R Finkelstein	8/23/88 3 30 P	Martin Moore			
Martin Moore	8/24/88	Karen Sajak			

Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks
				* Total Metals = As, Ba, Cd, Cr, Hg, Se, Ag, Pb

Distribution Original Accompanies Shipment. Copy returned with Report.

WADSWORTH/ALERT LABORATORIES

4101 SHUFFEL DRIVE N.W./NORTH CANTON, OHIO 44720
(216) 497-9396

Chain-of Custody Record

10695C

№ ~~10695~~

PROJ. NO.	PROJECT NAME/LOCATION
88-431	VPD-HAZWCU-Bedford, OHIO

SAMPLERS: *(Signature)* Robert Finkelstein Martin Mann

STA. NO.	DATE	TIME	COMP.	GRAB.	STATION LOCATION	NO. OF CONTAINERS	8010	8020	8240	EP Tox Metals only	REMARKS
VPD-82388-17	8/23/88	1115		X	Grid #7-Excavated Soils Pile	1-4oz jar				X	
VPD-82388-18	8/23/88	1115		X	Grid #7-Excavated Soils Pile	2-40ml vials			X		VS water
VPD-82488-19	8/24/88	4:25pm		X	Grid #11-	2	X	X			
VPD-82488-20	8/24/88	4:25pm		X	Grid #11-	1				X	
VPD-82488-26	8/24/88	3:05		X	Waste Rinseate-#17	2	X	X			
VPD-82488-27	8/24/88	3:05		X	Waste Rinseate-#12	1				X	

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
R. Finkelstein	8/23/88 5:30P	Martin Mann			
Martin Mann	8/24/88 5:15P	R. Bujak			

Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks

Distribution Original Accompanies Shipment. Copy returned with Report.

PLEASE HOLD

PLEASE HOLD

WADSWORTH/ALERT LABORATORIES

4101 SHUFFEL DRIVE N.W./NORTH CANTON, OHIO 44720
(216) 497-9396

Chain-of Custody Record

№ ~~10695~~ 10695D

PROJ. NO.	PROJECT NAME/LOCATION
88-431	VPD-HAZWCU-Bedford, OH

SAMPLERS: (Signature) Martin Moore

STA. NO.	DATE	TIME	COMP.	GRAB.	STATION LOCATION	NO. OF CONTAINERS	Total Metals			8240	EPTox Metals Only	REMARKS
VPD-82488-21	8/24/88	11:45		X	5'East, 65' North - ~~so~~ asphalt, rep.	2				X		Asphalt ~~Soil~~
VPD-82488-22	8/24/88	11:35p		X	5'East; 65' North - soil	2				X		Soil ~~Asphalt~~
VPD-82488-23	8/24/88	2:05		X	10' East, 10' North - rep. of asphalt	1					X	Asphalt
VPD-82488-24	8/24/88	2:10		X	10' East, 10' North - soil	1	X					Soil
VPD-82488-25	8/24/88	2:30		X	Grid #23 - asphalt pile	2				X	X	asphalt/soil
VPD-82488												

PLEASE Hold THESE SAMPLES UNTIL GO AHEAD GIVEN

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Martin Moore	8-24-88 / 5:15p	K Bryak			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)

Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks

Distribution Original Accompanies Shipment. Copy returned with Report.

APPENDIX B

Statistically Derived Sampling Location Data

STATISTICAL SAMPLING GRID
Inside Storage Area

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	<u>17</u>	18
19	20	21	22	23	24	25	26	27
						28	29	30
						31	32	33
						34	35	36
						37	38	39
						40	41	42
						43	44	45
						46	47	48
						49	50	51
						52	53	54

N ↑

1 inch = 2 feet

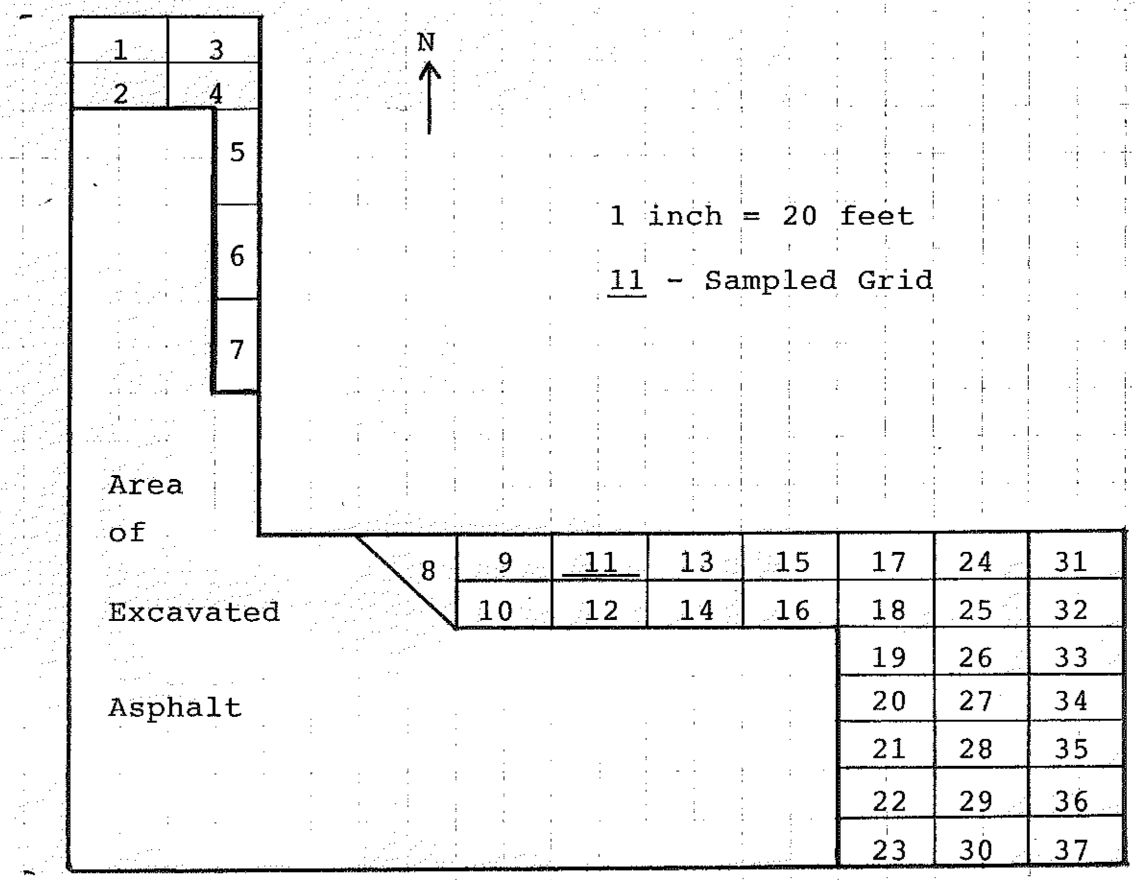
<u>17</u> - Sampled Grid

Toxcon Engineering Company, Inc.

September 29, 1988

STATISTICAL SAMPLING GRID

Outside Storage Area



Toxcon Engineering Company, Inc.

September 29, 1988

1938-1988
WADSWORTH/ALERT
LABORATORIES, INC.
50 YEARS
Sampling, testing, mobile labs
5405 E. Schaaf Rd./P.O. Box 31454/Cleveland, OH 44131/(216) 642-9151

ANALYTICAL REPORT

Project No. 5800

Presented to :

Marten Mosis

Toxcon Engineering Company, Inc.

WADSWORTH/ALERT LABORATORIES, INC.

Dale Mori

Dale Mori
Project Manager

J. William Botimer

J. William Botimer
Laboratory Manager - Cleveland

September 26, 1988

WADSWORTH/ALERT LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED:** 8/24/88
LAB #: 5799-31790
MATRIX : SOIL

SAMPLE ID : VPD-82288-01 BG-1

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	8/30- 9/ 9/88	11	2	mg/kg
Arsenic	8/30- 9/ 7/88	7.7	5	mg/kg
Barium	8/30- 9/ 9/88	810	20	mg/kg
Cadmium	8/30- 9/ 8/88	1.9	1	mg/kg
Chromium	8/30- 9/ 8/88	11	5	mg/kg
Mercury	8/30- 9/ 8/88	ND	0.50	mg/kg
Lead	8/30- 9/ 9/88	1,400	10	mg/kg
Selenium	8/30- 9/ 7/88	0.6	0.5	mg/kg

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED:** 8/24/88
LAB #: 5799-31791
MATRIX : SOIL

SAMPLE ID : VPD-82288-02 BG-2

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	8/30- 9/ 9/88	19	2	mg/kg
Arsenic	8/30- 9/ 7/88	6.3	5	mg/kg
Barium	8/30- 9/ 9/88	140	20	mg/kg
Cadmium	8/30- 9/ 8/88	1.6	1	mg/kg
Chromium	8/30- 9/ 8/88	17	5	mg/kg
Mercury	8/30- 9/ 8/88	ND	0.50	mg/kg
Lead	8/30- 9/ 9/88	170	10	mg/kg
Selenium	8/30- 9/ 7/88	ND	0.5	mg/kg

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED:** 8/24/88
LAB #: 5799-31792
MATRIX : SOIL

SAMPLE ID : VPD-82288-03 BG-3

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	8/30- 9/ 9/88	ND	2	mg/kg
Arsenic	8/30- 9/ 7/88	11	5	mg/kg
Barium	8/30- 9/ 9/88	51	20	mg/kg
Cadmium	8/30- 9/ 8/88	1.9	1	mg/kg
Chromium	8/30- 9/ 8/88	12	5	mg/kg
Mercury	8/30- 9/ 8/88	ND	0.50	mg/kg
Lead	8/30- 9/ 9/88	160	10	mg/kg
Selenium	8/30- 9/ 7/88	0.5	0.5	mg/kg

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED:** 8/24/88
LAB #: 5799-31793
MATRIX : SOIL

SAMPLE ID : VPD-82288-04 BG-4

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	8/30- 9/ 9/88	ND	2	mg/kg
Arsenic	8/30- 9/ 7/88	12	5	mg/kg
Barium	8/30- 9/ 9/88	37	20	mg/kg
Cadmium	8/30- 9/ 8/88	2	1	mg/kg
Chromium	8/30- 9/ 8/88	13	5	mg/kg
Mercury	8/30- 9/ 8/88	ND	0.50	mg/kg
Lead	8/30- 9/ 9/88	150	10	mg/kg
Selenium	8/30- 9/ 7/88	0.5	0.5	mg/kg

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED:** 8/24/88
LAB #: 5799-31794
MATRIX : WATER

SAMPLE ID : VPD-82288-05 GRID 17 - INSIDE STORAGE AREA

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	8/30- 9/ 9/88	ND	0.02	mg/l
Arsenic	8/30- 9/ 1/88	0.007	0.005	mg/l
Barium	8/30- 9/ 9/88	ND	0.20	mg/l
Cadmium	8/30- 9/ 8/88	ND	0.01	mg/l
Chromium	8/30- 9/ 8/88	ND	0.05	mg/l
Mercury	8/30- 9/ 1/88	ND	0.005	mg/l
Lead	8/30- 9/ 9/88	ND	0.05	mg/l
Selenium	8/30- 9/ 1/88	ND	0.005	mg/l

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Toxcon Engineering Company, Inc.
LAB #: 5799-31795
MATRIX: WATER

DATE RECEIVED: 8/24/88
DATE EXTRACTED: 8/30/88
DATE ANALYZED: 8/30/88

SAMPLE ID: VPD-82288-06 GRID 17 - INSIDE STORAGE AREA

VOLATILE ORGANICS
USEPA METHOD 8240 - GC/MS

Benzene	ND	1,1-Dichloroethene	ND
Bromodichloromethane	ND	trans-1,2-Dichloroethene	ND
Bromoform	ND	1,2-Dichloropropane	ND
Bromomethane	ND*	cis-1,3-Dichloropropene	ND
Carbon tetrachloride	ND	trans-1,3-Dichloropropene	ND
Chlorobenzene	4 J	Ethylbenzene	ND
Chloroethane	ND*	Methylene chloride	ND
2-Chloroethylvinyl ether	ND*	1,1,2,2-Tetrachloroethane	ND
Chloroform	ND	Tetrachloroethene	4 J
Chloromethane	ND*	Toluene	ND
Dibromochloromethane	ND	1,1,1-Trichloroethane	ND
1,2-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,3-Dichlorobenzene	ND	Trichloroethene	ND
1,4-Dichlorobenzene	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND*
1,2-Dichloroethane	ND		

NOTE:
ND (None Detected, lower detectable limit = 5 ug/l) as rec'd
ND* (None Detected, lower detectable limit = 10 ug/l) as rec'd
J (Detected, but below quantitation limit; quantitation suspect)
B (Compound detected in method blank associated with this sample)
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
1,2-Dichloroethane-d4	96	(76-114)	(70-121)
Toluene-d8	106	(88-110)	(81-117)
Bromofluorobenzene	99	(86-115)	(74-121)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: Toxcon Engineering Company, Inc.
LAB #: 5799-31795
MATRIX: WATER

DATE RECEIVED: 8/24/88
DATE EXTRACTED: 8/30/88
DATE ANALYZED: 8/30/88

SAMPLE ID: VPD-82288-06 GRID 17 - INSIDE STORAGE AREA

VOLATILE ORGANICS
OTHER COMPOUNDS

None

MASS SPECTROMETER/DATA SYSTEM (MSDS) TENTATIVELY IDENTIFIED COMPOUNDS
with their estimated concentrations

Bromobenzene	<10 ug/l
1-Chlorohexane	<10 ug/l
Chlorotoluene	<10 ug/l
Dibromomethane	<10 ug/l
Total Xylenes	<10 ug/l

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED:** 8/24/88
LAB #: 5799-31796
MATRIX : SOIL

SAMPLE ID : VPD-82288-07 SW CORNER OF LOT

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	8/30- 9/ 9/88	37	2	mg/kg
Arsenic	8/30- 9/ 7/88	21	5	mg/kg
Barium	8/30- 9/ 9/88	170	20	mg/kg
Cadmium	8/30- 9/ 8/88	2.6	1	mg/kg
Chromium	8/30- 9/ 8/88	19	5	mg/kg
Mercury	8/30- 9/ 8/88	0.56	0.50	mg/kg
Lead	8/30- 9/ 9/88	11,000	100	mg/kg
Selenium	8/30- 9/ 7/88	ND	0.5	mg/kg

NOTE: ND (None Detected)

WADSWORTH/ALERT LABORATORIES, INC.

COMPANY: Toxcon Engineering Company, Inc.
LAB #: 5799-31797
MATRIX: SOIL

DATE RECEIVED: 8/24/88
DATE EXTRACTED: 8/26/88
DATE ANALYZED: 8/26/88

SAMPLE ID: VPD-82288-08 SW CORNER OF LOT

VOLATILE ORGANICS
USEPA METHOD 8240 - GC/MS

Benzene	ND	1,1-Dichloroethene	ND
Bromodichloromethane	ND	trans-1,2-Dichloroethene	0.5 J
Bromoform	ND	1,2-Dichloropropane	ND
Bromomethane	ND*	cis-1,3-Dichloropropene	ND
Carbon tetrachloride	ND	trans-1,3-Dichloropropene	ND
Chlorobenzene	ND	Ethylbenzene	ND
Chloroethane	ND*	Methylene chloride	ND
2-Chloroethylvinyl ether	ND*	1,1,2,2-Tetrachloroethane	ND
Chloroform	ND	Tetrachloroethene	8
Chloromethane	ND*	Toluene	ND
Dibromochloromethane	ND	1,1,1-Trichloroethane	ND
1,2-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,3-Dichlorobenzene	ND	Trichloroethene	ND
1,4-Dichlorobenzene	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND*
1,2-Dichloroethane	ND		

NOTE: ND (None Detected, lower detectable limit = 1 mg/kg) as rec'd
ND* (None Detected, lower detectable limit = 2 mg/kg) as rec'd
J (Detected, but below quantitation limit; quantitation suspect)
B (Compound detected in method blank associated with this sample)
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
1,2-Dichloroethane-d4	94	(76-114)	(70-121)
Toluene-d8	99	(88-110)	(81-117)
Bromofluorobenzene	98	(86-115)	(74-121)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : Toxcon Engineering Company, Inc. **DATE RECEIVED:** 8/24/88
LAB #: 5799-31798
MATRIX : SOIL

SAMPLE ID : VPD-82288-09 20' N OF 07

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Silver	8/30- 9/ 9/88	13	2	mg/kg
Arsenic	8/30- 9/ 7/88	15	5	mg/kg
Barium	8/30- 9/ 9/88	55	20	mg/kg
Cadmium	8/30- 9/ 8/88	2.2	1	mg/kg
Chromium	8/30- 9/ 8/88	16	5	mg/kg
Mercury	8/30- 9/ 8/88	0.74	0.50	mg/kg
Lead	8/30- 9/ 9/88	5,200	100	mg/kg
Selenium	8/30- 9/ 7/88	0.5	0.5	mg/kg

NOTE: ND (None Detected)

WADSWORTH/ALERT LABORATORIES, INC.

COMPANY: Toxcon Engineering Company, Inc.
LAB #: 5799-31799
MATRIX: SOIL

DATE RECEIVED: 8/24/88
DATE EXTRACTED: 8/26/88
DATE ANALYZED: 8/26/88

SAMPLE ID: VPD-82288-10 20' N OF 07

VOLATILE ORGANICS
USEPA METHOD 8240 - GC/MS

Benzene	ND	1,1-Dichloroethene	ND
Bromodichloromethane	ND	trans-1,2-Dichloroethene	ND
Bromoform	ND	1,2-Dichloropropane	ND
Bromomethane	ND*	cis-1,3-Dichloropropene	ND
Carbon tetrachloride	ND	trans-1,3-Dichloropropene	ND
Chlorobenzene	ND	Ethylbenzene	ND
Chloroethane	ND*	Methylene chloride	ND
2-Chloroethylvinyl ether	ND*	1,1,2,2-Tetrachloroethane	ND
Chloroform	ND	Tetrachloroethene	4
Chloromethane	ND*	Toluene	ND
Dibromochloromethane	ND	1,1,1-Trichloroethane	ND
1,2-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,3-Dichlorobenzene	ND	Trichloroethene	0.9 J
1,4-Dichlorobenzene	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND*
1,2-Dichloroethane	ND		

NOTE: ND (None Detected, lower detectable limit = 1 mg/kg) as rec'd
ND* (None Detected, lower detectable limit = 2 mg/kg) as rec'd
J (Detected, but below quantitation limit; quantitation suspect)
B (Compound detected in method blank associated with this sample)
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
1,2-Dichloroethane-d4	113	(76-114)	(70-121)
Toluene-d8	117	(88-110)	(81-117)
Bromofluorobenzene	113	(86-115)	(74-121)

A.4.5

OhioEPA
State Of Ohio Environmental Protection Agency
P.O. Box 1049, 361 East Broad St., Columbus, Ohio 43216-1049
(614) 466-8565

Richard F. Celeste, Governor

RE: Vernitron Piezoelectric
OHD 052324290

Mr. Pat Martel
Vernitron Corporation
2001 Marcus Avenue
Lake Success, New York 11042

July 28, 1986

Dear Mr. Martel:

I hereby acknowledge the receipt of a 1986 financial test demonstration. Ohio EPA has completed its review of Vernitron Piezoelectric's 1986 RCRA financial test submission. Vernitron Piezoelectric appears to adequately meet the financial test criteria at this time. Consequently, the facility referenced above is in compliance with Ohio's financial responsibility rules for closure.

If you have any questions, please contact me at (614) 462-8949.

Sincerely,

Edward A. Kitchen
Surveillance & Enforcement Section
Division of Solid & Hazardous
Waste Management

cc: Dave Sholtis, DSHWM
Dave WErtz, NEDO

VERNITRON CORPORATION
2001 MARCUS AVENUE, LAKE SUCCESS, NY 11042 □ (516) 775-8200 □ TWX 510 223 0409

May 21, 1984

LEGAL DEPARTMENT

REF: GR-53

RECEIVED

MAY 23 1984

EPA REGION 5
OFFICE OF REGIONAL ADMINISTRATOR

Valdas Adamkos
Regional Administrator
United States Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

RE: Financial Responsibility For: (i) Liability Coverage; and
(ii) Closure and/or Post-Closure Case

Vernitron Piezoelectric Division of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146
Corporate Office: Vernitron Corporation
2001 Marcus Avenue
Lake Success, New York 11042

EPA I. D. No.: OHD052324290

Dear Sir:

Enclosed please find a letter from Vernitron Corporation's Chief Financial Officer, together with the required enclosures, which provides proof of financial assurance of liability coverage and closure and/or post-closure care for our Piezoelectric Division, Bedford, Ohio.

Formerly, such financial assurance was provided to the U.S. Environmental Protection Agency. However, it is now requested that compliance with Ohio rules be accepted in place of compliance with U.S. Environmental Protection Agency regulations.

Kindly acknowledge receipt of the enclosed documents for filing by signing and returning the copy of this letter in the envelope provided.

Very truly yours,

Patricia Martel

Patricia Martel,
Environmental Compliance Manager

RECEIPT ACKNOWLEDGED:

United States Environmental Protection Agency

By________________________________

Encl.
cc: Lawrence J. Schwartz, General Counsel
Ohio Environmental Protection Agency -- DHMM

VERNITRON CORPORATION
2001 MARCUS AVENUE, LAKE SUCCESS, NY 11042 □ (516) 775-8200 □ TWX 510 223 0409

May 21, 1984

LEGAL DEPARTMENT

REF: GR-53

Ohio Environmental
Protection Agency -- DHMM
361 East Broad Street
Columbus, Ohio 43215-1049

Attention: Ms. Deborah L. Tegtmeyer

RE: Financial Responsibility For: (i) Liability Coverage; and
(ii) Closure and/or Post-Closure Case

Vernitron Piezoelectric Division Of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146

Corporate Office: Vernitron Corporation
2001 Marcus Avenue
Lake Success, New York 11042

EPA I. D. No.: OHD052324290

Dear Sir:

I am writing on behalf of our Piezoelectric Division, as referenced above:

In accordance with your request for proof of financial assurance of liability coverage and closure and/or post-closure care, enclosed please find the following documentation required by Rule 3745-55-51 of the Ohio Administrative Code:

1. Letter dated May 9, 1984 of the Chief Financial Officer of Vernitron Corporation;
2. Annual Report of Vernitron Corporation for 1983;
3. Special Report of Vernitron's independent certified public accountants, dated May 14, 1984; and
4. Letter to the Regional Administrator requesting that compliance with Ohio rules be accepted in place of compliance with United States EPA Regulations.

Should you have any questions, or require clarification of any information provided, please call me at (516) 775-8200, Ext. 23.

Very truly yours,

Patricia Martel

Patricia Martel,
Environmental Compliance Manager

/mjm
Enclosures

cc: Bernard Levine, Chief Financial Officer
Lawrence J. Schwartz, General Counsel
Valdas Adamkos, Regional Administrator, U.S. EPA ✓

VERNITRON CORPORATION
2001 MARCUS AVENUE, LAKE SUCCESS, NY 11042 □ (516) 775-8200 □ TWX 510 223 0409

EXECUTIVE OFFICES
RE: GR-53

May 9, 1984

Director,
Ohio Environmental Protection Agency
361 East Broad Street
Columbus, Ohio 43215-1049

RE: Financial Responsibility For: (i) Liability Coverage; and
(ii) Closure and/or Post-Closure Case

Vernitron Peizoelectric Division Of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146

Corporate Office: Vernitron Corporation
2001 Marcus Avenue
Lake Success, New York 11042

EPA I. D. No.: OHD052324290

Dear Sir:

I am the Chief Financial Officer of Vernitron Piezoelectric Division of Vernitron Corporation, located at 232 Forbes Road, Bedford, Ohio 44146. This letter is in support of the use of the financial test to demonstrate financial responsibility for liability coverage and closure and/or post-closure care as specified in chapters 3745-55 and 3745-66 of the Administrative Code.

The owner or operator identified above is the owner or operator of the following facility for which liability coverage is being demonstrated through the financial test specified in chapters 3745-55 and 3745-66 of the Administrative Code:

Vernitron Peizoelectric Division
232 Forbes Road
Bedford, Ohio 44146

EPA I.D. No.: OHD052324290

1. The owner or operator identified above owns or operates the following facility for which financial assurance for closure or post-closure care is demonstrated

.../...

VERNITRON CORPORATION

through the financial test specified in chapters 3745-55 or 3745-66 of the Administrative Code. The current closure and/or post-closure cost estimates covered by the test are shown for each facility:

Vernitron Peizoelectric Division of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146

EPA I. D. No.: OHD052324290

Current Closure
Cost Estimate: $[redacted]

Current Post-Closure
Cost Estimate: Not Applicable

2. The owner or operator identified above guarantees, through the corporate guarantee specified in chapters 3745-55 and 3745-66 of the Administrative Code, the closure and post-closure care of the following facilities owned or operated by its subsidiaries. The current cost estimates for the closure or post-closure care so guaranteed are shown for each facility:

NONE

3. The owner or operator identified above owns or operates the following hazardous waste management facilities for which financial assurance for closure or, if a disposal facility, post-closure care, is not demonstrated through the financial test or any other financial assurance mechanism specified in chapters 3745-55 or 3745-66 of the Administrative Code. The current closure and/or post-closure cost estimates not covered by such financial assurance are shown for each facility:

NONE

This owner or operator is required to file a Form 10-K with the Securities and Exchange Commission (SEC) for the latest fiscal year.

The fiscal year of this owner or operator ends on December 29, 1984. The figures for the following items marked with an asterisk are derived from this owner's or operator's independently audited, year-end financial statements for the latest completed fiscal year, ended December 31, 1983.

.../...

VERNITRON CORPORATION

ALTERNATIVE I

1. Sum of current closure and post-closure cost estimates [redacted] [redacted] ______ [redacted] ______.

2. Amount of annual aggregate liability coverage to be demonstrated $[redacted].

3. Sum of line 1 and 2 ______ $ [redacted] ______.

*4. Total liabilities (if any portion of your closure or post-closure cost estimates is included in your total liabilities, you may deduct that portion from this line and add that amount to lines 5 and 6) ______ $[redacted] ______.

*5. Tangible Net Worth ______ $[redacted] ______.

*6. Net Worth ______ [redacted] ______.

*7. Current Assets ______ $[redacted] ______.

*8. Current Liabilities ______ $[redacted] ______.

*9. Net Working Capital (line 7 minus line 8) ______ $ [redacted] ______.

*10. The sum of net income plus depreciation, depletion, and amortization $[redacted].

*11. Total assets in United States (required only if less than 90% of assets are located in the United States) ______ Not Applicable ______.

		Yes	No
12.	Is line 5 at least $10 million?	x	
13.	Is line 5 at least 6 times line 3?	x	
14.	Is line 9 at least 6 times line 3?	x	
*15.	Are at least 90% of assets located in the United States? If not, complete line 16.	x	
16.	Is line 11 at least 6 times line 3?	x	
17.	Is line 4 divided by line 6 less than 2.0?	x	
18.	Is line 10 divided by line 4 greater than 0.1?	x	
19.	Is line 7 divided by line 8 greater than 1.5?	x	

.../...

VERNITRON CORPORATION

I hereby certify that the wording of this letter is identical to the wording specified in paragraph (g) of rule 3745-55-51 of the Administrative Code as such regulations were constituted on the date shown immediately below.

Very truly yours,

VERNITRON CORPORATION

By_______________

Bernard Levine,
Chief Financial Officer
Date: May 9 , 1984

/mjm

Ernst & Whinney

153 East 53rd Street
New York, New York 10022

212/888-9100

May 14, 1984

Mr. Bernard Levine
Vice Chairman of the Board and
Chief Financial Officer
Vernitron Corporation
2001 Marcus Avenue
Lake Success, New York 11042

Dear Mr. Levine:

At your request, we have read your letter to the Director of the Ohio Environmental Protection Agency, dated May 9, 1984, and compared the data in such letter which you have specified as derived from the consolidated financial statements of Vernitron Corporation and subsidiaries ("Vernitron") as of December 31, 1983 and for the year (53 weeks) then ended, with related amounts in such financial statements. In connection with the procedure referred to above, no matters came to our attention that caused us to believe that the specified data should be adjusted. Because the above procedure does not constitute an examination made in accordance with generally accepted auditing standards, we do not express an opinion on the specified data mentioned above; however, we previously made an examination of Vernitron's consolidated financial statements in accordance with generally accepted auditing standards and, in our report dated February 27, 1984, expressed an unqualified opinion on Vernitron's consolidated financial statements as of and for the year (53 weeks) ended December 31, 1983 from which the specified data was derived.

The aforementioned procedure was performed solely to assist you in complying with the regulations of the Ohio Environmental Protection Agency, and this report is not to be used for any other purpose.

Ernst & Whinney

VERNITRON CORPORATION
2001 MARCUS AVENUE, LAKE SUCCESS, NY 11042 □ (516) 775-8200 □ TWX 510 223 0409

LEGAL DEPARTMENT

REF:GR-53 March 28, 1983

VIA FEDERAL EXPRESS

RCRA Activities
P.O. Box A3587
Chicago, Illinois 60690

Attention: Financial Requirements

RE: Assurance Of: (i) Liability Coverage; and
(ii) Closure or Post-Closure Care

Vernitron Piezoelectric Division of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146

Corporate Office: 2001 Marcus Avenue
Lake Success, New York 11042

EPA I.D. NO.: OHD052324290

Dear Sir:

I am writing on behalf of our Vernitron Piezoelectric Division, as referenced above.

In accordance with the EPA regulations, requiring proof of financial assurance of liability coverage and closure and/or post-closure care, enclosed please find the following documentation in satisfaction of the financial test specified in Subpart H of 40 CFR Parts 264 and 265:

1. Letter dated March 28, 1983 of the Chief Financial Officer of Vernitron Corporation; and

2. Form 10-K Annual Report of Vernitron Corporation for 1982, which includes the report of Vernitron's independent certified public accounts on examination of our financial statements for the latest completed fiscal year, at page 27 thereof.

VERNITRON CORPORATION

Due to the fact that Vernitron's fiscal year recently ended on December 25, 1982, I have not included a 'special report' from our independent certified public accountants. I trust their report in the enclosed Form 10-K Annual Report, referred to in paragraph (2) above, will be sufficient for your purposes. If not, please advise and I will arrange for the transmission of such 'special report'.

This submission will probably reach you a day or two late, and not "within 90 days after the end of the firm's fiscal year," as required in the Regulations. We apologize for the lateness; however, we have only today received printed copies of our Form 10-K Annual Report and letter from our independent certified public accountants.

Should you have any questions or require any clarification of the enclosed documents, please do not hesitate to contact me.

Kindly acknowledge receipt by stamping and returning the enclosed copy of this letter in the envelope provided.

Very truly yours,

VERNITRON CORPORATION

By Patricia Reale
Patricia Reale,
EPA Compliance Manager

PR/mjh
Enclosures

cc: Lawrence J. Schwartz, Esq.
General Counsel

Bernard Levine
Chief Financial Officer

Cass Stevens
Karen Boron, R.N.

OHD 052324290

VERNITRON CORPORATION

2001 MARCUS AVENUE, LAKE SUCCESS, NY 11042 □ (516) 775-8200 □ TWX 510 223 0409

EXECUTIVE OFFICES

March 28, 1983

RCRA Activities
P.O. Box A3587
Chicago, Illinois 60690

Attention: Financial Requirements

RE: Assurance Of: (i) Liability Coverage; and
(ii) Closure or Post-Closure Care

Vernitron Piezoelectric Division of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146

Corporate Office: 2001 Marcus Avenue
Lake Success, New York 11042

EPA I.D. NO.: OHD052324290 ok NC

Dear Sir:

I am the Chief Financial Officer of the Vernitron Piezoelectric Division of Vernitron Corporation, located at 232 Forbes Road, Bedford, Ohio 44146 This letter is in support of the use of the financial test to demonstrate financial responsibility for liability coverage and closure and/or post-closure care as specified in Subpart H of 40 CFR Parts 264 and 265.

SPEC REPT MISS

The owner or operator identified above is the owner or operator of the following facility for which liability coverage

VERNITRON CORPORATION

is being demonstrated through the financial test specified in Subpart H of 40 CFR Parts 264 and 265:

Vernitron Piezoelectric Division of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146
EPA I.D. NO.: OHD052324290

1. The owner or operator identified above owns or operates the following facility for which financial assurance for closure or post-closure care is demonstrated through the financial test specified in Subpart H of 40 CFR Parts 264 and 265. The current closure and/or post-closure cost estimates covered by the test are shown for each facility:

Vernitron Piezoelectric Division of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146
EPA I.D. NO.: OHD052324290

Current Closure Cost Estimate:	$[redacted]
Current Post-Closure Cost Estimate:	Not Applicable

2. The owner or operator identified above guarantees, through the corporate guarantee specified in Subpart H of 40 CFR Parts 264 and 265, the closure and post-closure care of the following facilities owned or operated by its subsidiaries. The current cost estimates for the closure or post-closure care so guaranteed are shown for each facility:

NOT APPLICABLE

3. In States where EPA is not administering the financial requirements of Subpart H of 40 CFR Parts 264 and 265, this owner or operator is demonstrating financial assurance for the closure or post-closure care of the following facilities through the use

VERNITRON CORPORATION

of a test equivalent or substantially equivalent to the financial test specified in Subpart H of 40 CFR Parts 264 and 265. The current closure and/or post-closure cost estimates covered by such a test are shown for each facility:

NOT APPLICABLE

4. The owner or operator indentified above owns or operates the following hazardous waste management facilities for which financial assurance for closure or, if a disposal facility, post-closure care, is not demonstrated either to EPA or a State through the financial test or any other financial assurance mechanism specified in Supbart H of 40 CFR Parts 264 and 265 or equivalent or substantially equivalent State mechanisms. The current closure and/or post-closure cost estimates not covered by such financial assurance are shown for each facility:

NOT APPLICABLE

This owner or operator (Vernitron Corporation) is required to file a Form 10-K with the Securities and Exchange Commission (SEC) for the latest fiscal year.

The fiscal year of this owner or operator ends on December 31, 1983. The figures for the following items marked with an asterisk are derived from the owner's or operator's independently audited, year-end financial statements for the latest completed fiscal year ended December 25, 1982.

<u>ALTERNATIVE I</u>

(Closure or Post-Closure Care and Liability Coverage)

1. Sum of current closure and post-closure cost estimates (total of all cost estimates listed above) .... $[redacted] nonresponsive

VERNITRON CORPORATION

2. Amount of annual aggregate liability coverage to be demonstrated .... $[redacted]

3. Sum of Lines 1 and 2 .... $[redacted]

*4. Total liabilities (if any portion of your closure or post-closure cost estimates is included in your total liabilities, you may deduct that portion from this line and add that amount to lines 5 and 6) .... [redacted]

*5. Tangible Net Worth .... $[redacted]

*6. Net Worth .... $[redacted]

*7. Current Assets .... $[redacted]

*8. Current Liabilities .... $[redacted]

9. Net Working Capital (line 7 minus line 8) ... $[redacted]

*10. The sum of Net Income plus depreciation, depletion, and amortization .... $[redacted]

*11. Total Assets in U.S. (required only if less than 90% of assets are located in the U.S.).. $ N/A

	Yes	No
12. Is line 5 at least $10 million?	X	
13. Is line 5 at least 6 times line 3?	X	
14. Is line 9 at least 6 times line 3?	X	
*15. Are at least 90% of assets located in the U.S.? If not, complete line 16.	X	
16. Is line 11 at least 6 times line 3?	X	

VERNITRON CORPORATION

17. Is line 4 divided by line 6 less than 2.0? _X_ ___

18. Is line 10 divided by line 4 greater than 0.1? _X_ ___

19. Is line 7 divided by line 8 greater than 1.5? _X_ ___

I hereby certify that the wording of this letter is identical to the wording specified in 40 CFR 264.151(g) as such regulations were constituted on the date shown immediately below.

Very truly yours,

VERNITRON CORPORATION

By___________________________
Bernard Levine,
Chief Financial Officer

Date: March 28, 1983

PR/mjh

cc: Regional Administrator
Environmental Protection Agency
Region V
Waste Management Branch
230 South Dearborn Street
Chicago, Illinois 60604

Patricia Reale
Vernitron Corporation
EPA Compliance Manager

L. J. Schwartz, Esq.,
General Counsel
Vernitron Corporation

OHD052324290

OHD 052 324 290

VERNITRON CORPORATION

2001 MARCUS AVENUE, LAKE SUCCESS, NY 11042 □ (516) 775-8200 □ TWX 510 223 0409

LEGAL DEPARTMENT

REF: GR-53

January 5, 1983

RCRA Activities
P.O. Box A3587
Chicago, IL 60690

Attn: Financial Requirements

RE: Vernitron Piezoelectric Division of Vernitron Corporation

EPA I.D. No.: OHD052324290 PA, G, TSD

Dear Madam/Sir:

Under date of October 27, 1982 I forwarded you proof of financial assuarance of liability coverage and closure and/or post-closure care on behalf of our Piezoelectric Division (copy enclosed). At the same time I requested that you acknowledge receipt by returning a copy of my letter stamped by your office; however, to date, I have not received such copy.

Accordingly, I would appreciate your stamping and returning the enclosed copy of my October 27 transmittal letter in the self-addressed envelope provided.

Very truly yours,

Patricia Reale

Patricia Reale
EPA Compliance Manager

Encl.

RECEIVED 1/10/83

WASTE MANAGEMENT BRANCH (5AHWM)
ENVIRONMENTAL PROTECTION AGENCY

10 JAN 1983

VERNITRON CORPORATION
2001 MARCUS AVENUE, LAKE SUCCESS, NY 11042 □ (516) 775-8200 □ TWX 510 223 0409

LEGAL DEPARTMENT

REF: GR-53 October 27, 1982

VIA FEDERAL EXPRESS

RCRA Activities
P.O. Box A3587
Chicago, Illinois 60690

Attention: Financial Requirements

RE: Assurance Of: (i) Liability Coverage; and
(ii) Closure or Post-Closure Care

Vernitron Piezoelectric Division of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146

Corporate Office: 2001 Marcus Avenue
Lake Success, New York 11042

EPA I.D. NO.: OHD052324290

Dear Sir:

I am writing on behalf of our Vernitron Piezoelectric Division, as referenced above.

In accordance with your request for proof of financial assurance of liability coverage and closure and/or post-closure care, enclosed please find the following documentation in satisfaction of the financial test specified in Subpart H of 40 CFR Parts 264 and 265:

1. Letter dated October 26, 1982 of the Chief Financial Officer of Vernitron Corporation;

2. Annual Report of Vernitron Corporation for 1981, which includes the report of Vernitron's independent certified public accounts on examination of our financial statements for the latest completed fiscal year, at page 20 thereof; and

3. Special report of Vernitron's independent certified public accounts, dated October 26, 1982.

We apologize for the lateness of this submission; however, please be assured that I have taken steps to assure timely compliance with all future E.P.A. regulations.

Should you have any questions or require any clarification of the enclosed documents, please do not hesitate to contact me.

Very truly yours,

VERNITRON CORPORATION

By Patricia Reale
Patricia Reale,
EPA Compliance Manager

PR/mjh
Enclosures

cc: Lawrence J. Schwartz, Esq.
General Counsel

Bernard Levine
Chief Financial Officer

P.S. Kindly acknowledge receipt by stamping and returning the attached copy of this letter in the envelope provided.

VERNITRON CORPORATION

2001 MARCUS AVENUE, LAKE SUCCESS, NY 11042 □ (516) 775-8200 □ TWX 510 223 0409

EXECUTIVE OFFICES

October 26, 1982

RCRA Activities
P.O. Box A3587
Chicago, Illinois 60690

Attention: Financial Requirements

RE: Assurance Of: (i) Liability Coverage; and
(ii) Closure or Post-Closure Care

Vernitron Piezoelectric Division of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146

Corporate Office: 2001 Marcus Avenue
Lake Success, New York 11042

EPA I.D. NO.: OHD052324290

Dear Sir:

I am the Chief Financial Officer of the Vernitron Piezoelectric Division of Vernitron Corporation, located at 232 Forbes Road, Bedford, Ohio 44146. This letter is in support of the use of the financial test to demonstrate financial responsibility for liability coverage and closure and/or post-closure care as specified in Subpart H of 40 CFR Parts 264 and 265.

The owner or operator identified above is the owner or operator of the following facility for which liability coverage is being demonstrated through the financial test specified in Subpart H of 40 CFR Parts 264 and 265:

Vernitron Piezoelectric Division of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146
EPA I.D. NO.: OHD052324290

1. The owner or operator identified above owns or operates the following facility for which financial assurance for closure or post-closure care is demonstrated through the financial test specified in Subpart H of 40 CFR Parts 264 and 265. The current closure and/or post-closure cost estimates covered by the test are shown for each facility:

Vernitron Piezoelectric Division of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146
EPA I.D. NO.: OHD052324290

Current Closure Cost Estimate:	$[redacted]
Current Post-Closure Cost Estimate:	Not Applicable

2. The owner or operator identified above guarantees, through the corporate guarantee specified in Subpart H of 40 CFR Parts 264 and 265, the closure and post-closure care of the following facilities owned or operated by its subsidiaries. The current cost estimates for the closure or post-closure care so guaranteed are shown for each facility:

NOT APPLICABLE

3. In States where EPA is not administering the financial requirements of Subpart H of 40 CFR Parts 264 and 265, this owner or operator is demonstrating financial assurance for the closure or post-closure care of the following facilities through the use

of a test equivalent or substantially equivalent to the financial test specified in Subpart H of 40 CFR Parts 264 and 265. The current closure and/or post-closure cost estimates covered by such a test are shown for each facility:

NOT APPLICABLE

4. The owner or operator indentified above owns or operates the following hazardous waste management facilities for which financial assurance for closure or, if a disposal facility, post-closure care, is not demonstrated either to EPA or a State through the financial test or any other financial assurance mechanism specified in Supbart H of 40 CFR Parts 264 and 265 or equivalent or substantially equivalent State mechanisms. The current closure and/or post-closure cost estimates not covered by such financial assurance are shown for each facility:

NOT APPLICABLE

This owner or operator (Vernitron Corporation) is required to file a Form 10-K with the Securities and Exchange Commission (SEC) for the latest fiscal year.

The fiscal year of this owner or operator ends on December 25, 1982. The figures for the following items marked with an asterisk are derived from the owner's or operator's independently audited, year-end financial statements for the latest completed fiscal year ended December 26, 1981.

ALTERNATIVE I

(Closure or Post-Closure Care and Liability Coverage)

1. Sum of current closure and post-closure cost estimates (total of all cost estimates listed above) .... $[redacted]

2. Amount of annual aggregate liability coverage

to be demonstrated .... $[redacted]

3. Sum of Lines 1 and 2 .... $[redacted]

*4. Total liabilities (if any portion of your closure or post-closure cost estimates is included in your total liabilities, you may deduct that portion from this line and add that amount to lines 5 and 6) .... $[redacted]

*5. Tangible Net Worth .... $[redacted].

*6. Net Worth .... $[redacted].

*7. Current Assets .... $[redacted].

*8. Current Liabilities .... $[redacted].

9. Net Working Capital (line 7 minus line 8) ... $[redacted].

*10. The sum of Net Income plus depreciation, depletion, and amortization .... $[redacted].

*11. Total Assets in U.S. (required only if less than 90% of assets are located in the U.S.).. $ N/A

	Yes	No
12. Is line 5 at least $10 million?	X	
13. Is line 5 at least 6 times line 3?	X	
14. Is line 9 at least 6 times line 3?	X	
*15. Are at least 90% of assets located in the U.S.? If not, complete line 16.	X	
16. Is line 11 at least 6 times line 3?	X	
17. Is line 4 divided by line 6 less than 2.0?	X	

18. Is line 10 divided by line 4 greater than 0.1? X ___

19. Is line 7 divided by line 8 greater than 1.5? X ___

I hereby certify that the wording of this letter is identical to the wording specified in 40 CFR 264.151(g) as such regulations were constituted on the date shown immediately below.

Very truly yours,

VERNITRON CORPORATION

By ______________________

Bernard Levine,
Chief Financial Officer

Date: October 26, 1982

PR/mjh

cc: Regional Administrator
Environmental Protection Agency
Region V
Waste Management Branch
230 South Dearborn Street
Chicago, Illinois 60604

VERNITRON CORPORATION

2001 MARCUS AVENUE, LAKE SUCCESS, NY 11042 □ (516) 775-8200 □ TWX 510 223 0400

LEGAL DEPARTMENT

REF: GR-53

October 27, 1982

VIA FEDERAL EXPRESS

RCRA Activities
P.O. Box A3587
Chicago, Illinois 60690

Attention: Financial Requirements

RE: Assurance Of: (i) Liability Coverage; and
(ii) Closure or Post-Closure Care

Vernitron Piezoelectric Division of
Vernitron Corporation
232 Forbes Road
Bedford, Ohio 44146

Corporate Office: 2001 Marcus Avenue
Lake Success, New York 11042

EPA I.D. NO.: OHD052324290

Dear Sir:

I am writing on behalf of our Vernitron Piezoelectric Division, as referenced above.

In accordance with your request for proof of financial assurance of liability coverage and closure and/or post-closure care, enclosed please find the following documentation in satisfaction of the financial test specified in Subpart H of 40 CFR Parts 264 and 265:

1. Letter dated October 26, 1982 of the Chief Financial Officer of Vernitron Corporation;

2. Annual Report of Vernitron Corporation for 1981, which includes the report of Vernitron's independent certified public accounts on examination of our financial statements for the latest completed fiscal year, at page 20 thereof; and

3. Special report of Vernitron's independent certified public accounts, dated October 26, 1982.

We apologize for the lateness of this submission; however, please be assured that I have taken steps to assure timely compliance with all future E.P.A. regulations.

Should you have any questions or require any clarification of the enclosed documents, please do not hesitate to contact me.

Very truly yours,

VERNITRON CORPORATION

By Patricia Reale
Patricia Reale,
EPA Compliance Manager

PR/mjh
Enclosures

cc: Lawrence J. Schwartz, Esq.
General Counsel

Bernard Levine
Chief Financial Officer

P.S. Kindly acknowledge receipt by stamping and returning the attached copy of this letter in the envelope provided.

OHD 052 324 290

Ernst & Whinney

153 East 53rd Street
New York, New York 10022

212/888-9100

October 26, 1982

Mr. Bernard Levine
Vice Chairman of the Board and
Chief Financial Officer
Vernitron Corporation
2001 Marcus Avenue
Lake Success, New York 11042

Dear Mr. Levine:

At your request, we have read your letter to the Regional Administrator of the Environmental Protection Agency, dated October 26, 1982, and compared the data in such letter which you have specified as derived from the consolidated financial statements of Vernitron Corporation and subsidiaries ("Vernitron") as of December 26, 1981 and for the year (52 weeks) then ended, with related amounts in such financial statements. In connection with the procedure referred to above, no matters came to our attention that caused us to believe that the specified data should be adjusted. Because the above procedure does not constitute an examination made in accordance with generally accepted auditing standards, we do not express an opinion on the specified data mentioned above; however, we previously made an examination of Vernitron's consolidated financial statements in accordance with generally accepted auditing standards and, in our report dated February 25, 1982, expressed an unqualified opinion on Vernitron's consolidated financial statements as of and for the year ended December 26, 1981 from which the specified data was derived.

The aforementioned procedure was performed solely to assist you in complying with the regulations of the Environmental Protection Agency, and this report is not to be used for any other purpose.

Ernst & Whinney

VERNITRON CORPORATION
2001 MARCUS AVENUE, LAKE SUCCESS, NY 11042 □ (516) 775-8200 □ TWX 510 223 0409

LEGAL DEPARTMENT

REF: GR-53

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

October 8, 1982

U.S. Environmental
Protection Agency
Region V
230 South Dearborn Street
Chicago, IL 60604

Attn: Wm. H. Miner, Chief
Technical Permits and
Compliance Section

RE: Piezoelectric Division of
Vernitron Corporation
EPA I.D. No.: OHD052324290
Your Ref. 5HW-TUB

Dear Sir:

On behalf of our Piezoelectric Division, Bedford, Ohio, and in connection with your recent letter requesting proof of financial assurance for closure, and proof of liability coverage, please be advised as follows:

Your letter was the first and only notification received concerning the proofs required and was immediately forwarded to my attention at the corporate office. As my records do not include a Section 40 CFR 265 G and H, which is necessary in order to comply with your request, I called Thomas B. Golz and in his absence spoke with Joseph Boyle. Mr. Boyle indicated that he would immediately forward a copy of the pertinent section of the regulations to my attention; upon receipt, please be assured that a prompt response will be prepared and mailed. If there is any problem, please call me.

Compliance with the hazardous waste regulations has and will always continue to receive top priority in our office. Accordingly, I would appreciate if you could recommend a service or particular volume of texts that would keep me apprised of all new or amended Federal Regulations covering hazardous waste compliance, so that we may avoid a similar situation from occurring in the future.

Very truly yours,

Patricia Reale

Patricia Reale

Encl.

RECEIVED
OCT 18 1982
WASTE MANAGEMENT BRANCH
EPA REGION V

cc: L. J. Schwartz, Esq.
C. Stevens

RCRA Activities,
Chicago, IL 60690